UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE

OPTIMORPHIX, INC., ***Plaintiff,*** v. **ALPHABET INC. AND GOOGLE LLC,** ***Defendants.***	**Civil Action No._____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

1. OptiMorphix, Inc. ("OptiMorphix" or "Plaintiff") brings this action and makes the following allegations of patent infringement relating to U.S. Patent Nos.: 7,099,273 (the "'273 patent"); 7,444,418 (the "'418 patent"); 7,031,314 (the "'314 patent"); 7,586,871 (the "'871 patent"); 7,616,559 (the "'559 patent"); 9,275,167 (the "'167 patent"); 9,191,664 (the "'664 patent"); 7,987,285 (the "'285 patent"); 7,991,904 (the "'904 patent"); 8,230,105 (the "'105 patent"); 8,769,141 (the "'141 patent"); 10,412,388 (the "'388 patent"); 8,429,169 (the "'169 patent"); and 9,167,021 (the "'021 patent") (collectively, the "patents-in-suit"). Defendants Alphabet Inc. and Google LLC (collectively, "Google" or "Defendant") infringe the patents-in-suit in violation of the patent laws of the United States of America, 35 U.S.C. § 1 *et seq*.

THE PARTIES

2. Plaintiff OptiMorphix, Inc. ("Plaintiff" or "OptiMorphix") is a Delaware corporation that holds a portfolio of over 250 patent assets that were developed at Citrix Systems, Inc. ("Citrix") and Bytemobile, Inc.

3. Bytemobile, Inc. ("Bytemobile") was a global leader in mobile internet solutions for network operators. The company was founded in 2000. Bytemobile's mission was to optimize

video and web content services for mobile network operators to improve users' experiences while maximizing the efficiency of network infrastructure.

4. Bytemobile was established during a time when the mobile landscape was evolving rapidly. The advent of 3G technology, coupled with increasingly sophisticated smartphones, led to a surge in demand for data services. However, mobile networks at the time were not optimized to handle this influx, particularly for data-rich services like video streaming. Recognizing this opportunity, Bytemobile sought to create solutions that would enable network operators to deliver high-quality, consistent mobile data services. By 2011, Bytemobile was a "market leader in video and web optimization, with more than 125 cumulative operator deployments in 60 countries.[1]

Andrew Zipern, *Vodafone in Deal with Start-Up Bytemobile*, NYTimes at C4 (January 29, 2002) ("Bytemobile, a wireless data start-up . . . reached a deal with Vodafone, Britain's largest mobile phone operator"); *NTT DoCoMo Launches Bytemobile Optimization Solution in its Core Network,* WIRELESSWATCH IP (October 5, 2004) ("NTT DoCoMo has deployed Bytemobile's optimization solution in its core network"); *China Mobile Selects Bytemobile for Nationwide Web Gateway Project*, BUSINESS WIRE (July 8, 2009) ("A Bytemobile customer since 2004, CMCC has deployed its web optimization solutions"); *Bytemobile Juices Up Orange*, ESPICOM TELECOMMUNICATION

[1] *Bytemobile: Importance of Video and Web Optimizations*, TELECOM REVIEW at 58 (2011); *see also Bytemobile Secures Its 36th Video Optimisation Win for MNO Deployment*, TOTAL TELECOM & TOTAL TELECOM MAGAZINE (March 21, 2011).

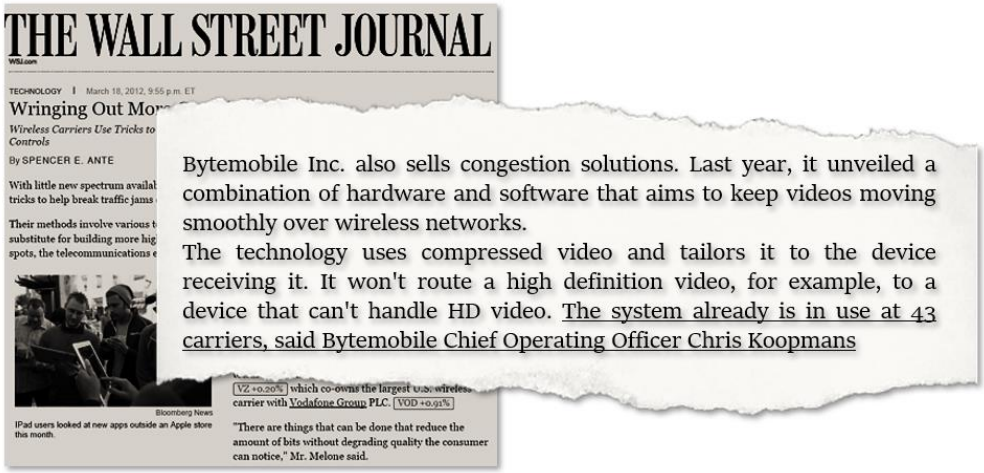
NEWS (October 10, 2002) ("Orange customers will experience faster application performance and Web page downloads"); *ByteMobile Wins 2013 LTE Award for Best LTE Traffic Management Product*, MARKETSCREENER (July 1, 2013) ("ByteMobile technology has been deployed . . . in networks serving nearly two billion subscribers.").

5. Bytemobile products, such as the Unison platform and the T3100 Adaptive Traffic Manager, were designed to optimize mobile data traffic in real-time, ensuring a high-quality mobile internet experience for end-users. This approach was groundbreaking at the time and set the stage for many of the mobile data optimization techniques used today.

6. Bytemobile's innovative technologies and customer-centric approach led to rapid growth and success. Bytemobile's innovative product portfolio included: the T3100 Adaptive Traffic Manager which was designed to handle high volumes of traffic efficiently and provide real-time optimization, compression, and management of mobile data; Bytemobile's T2000 Series Video Cache, which supported transparent caching of content; and Bytemobile's T1000 Series Traffic Director, which enabled traffic steering and load balancing for high availability of applications.

Bytemobile Adaptive Traffic Management Product Family, BYTEMOBILE DATA SHEET at 1-2 (2014).

7. Bytemobile's groundbreaking technologies also included products for data optimization. Bytemobile's data optimization solutions were designed to compress and accelerate data transfer. By reducing the size of data packets without compromising quality, these technologies allowed faster data transmission and minimized network congestion. Bytemobile also offered solutions to analyze and manage network traffic, allowing network operators to identify patterns, allocate bandwidth intelligently, and prioritize different types of content.



THE WALL STREET JOURNAL

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TECHNOLOGY | March 18, 2012, 9:55 p.m. ET

Wringing Out Mor...

Wireless Carriers Use Tricks to ... Controls

By SPENCER E. ANTE

With little new spectrum availabl... tricks to help break traffic jams ...

Their methods involve various t... substitute for building more hig... spots, the telecommunications ...

Bloomberg News

IPad users looked at new apps outside an Apple store this month.

Bytemobile Inc. also sells congestion solutions. Last year, it unveiled a combination of hardware and software that aims to keep videos moving smoothly over wireless networks.

The technology uses compressed video and tailors it to the device receiving it. It won't route a high definition video, for example, to a device that can't handle HD video. The system already is in use at 43 carriers, said Bytemobile Chief Operating Officer Chris Koopmans

VZ +0.20% which co-owns the largest U.S. wireless carrier with Vodafone Group PLC. VOD +0.91%

"There are things that can be done that reduce the amount of bits without degrading quality the consumer can notice," Mr. Melone said.

Spencer E. Ante, *Wringing Out More Capacity*, WALL STREET JOURNAL at B3 (March 19, 2012) (emphasis added).

8. In July 2012, Bytemobile was acquired by Citrix Systems, Inc. ("Citrix") for $435 million. Bytemobile "became part of [Citrix's] Enterprise division and extend[ed] [Citrix's] industry reach into the mobile and cloud markets."[2]

9. OptiMorphix owns a portfolio of patents developed at Bytemobile and later Citrix. Highlighting the importance of the patents-in-suit is the fact that the OptiMorphix's patent portfolio has been cited by over 4,800 U.S. and international patents and patent applications assigned to a wide variety of the largest companies operating in the networking, content delivery, and cloud computing fields. OptiMorphix's patents have been cited by companies such as:

[2] CITRIX SYSTEMS, INC. 2012 ANNUAL REPORT at 33 (2013).

- Amazon.com, Inc. (263 citing patents and applications)[3]
- Oracle (59 citing patents and applications)[4]
- ***Alphabet, Inc.*** (103 citing patents and applications)[5]
- Broadcom Ltd. (93 citing patents and applications)[6]
- Cisco Systems, Inc. (277 citing patents and applications)[7]
- Lumen Technologies, Inc. (77 citing patents and applications)[8]
- Intel Corporation (45 citing patents and applications)[9]
- Microsoft Corporation (150 citing patents and applications)[10]
- AT&T, Inc. (93 citing patents and applications)[11]
- Verizon Communications, Inc. (31 citing patents and applications)[12]
- Juniper Networks, Inc. (29 citing patents and applications)[13]

10. Defendant Google LLC is a limited liability company organized and existing under the laws of the State of Delaware. On information and belief, Google LLC, individually and collectively with Alphabet Inc. is involved in the design, manufacture, use, offering for sale, sale, and/or importation to the United States of the Accused Products defined below. Google LLC has a registered agent to accept service of process within the State of Delaware located at Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

11. Defendant Alphabet Inc. (collectively referred to with Google LLC herein as "Google" or "Defendant") is a corporation organized and existing under the laws of the State of Delaware. On information and belief, Alphabet Inc. is the ultimate parent company of Google LLC. On information and belief, Alphabet Inc., individually and collectively with Google LLC, is involved in the design, manufacture, use, offering for sale, sale, and/or importation to the United

[3] *See e.g.*, U.S. Patent Nos. 7,817,563; 9,384,204; 9,462,019; 11,343,551; and 11,394,620.
[4] *See e.g.*, U.S. Patent Nos. 7,475,402; 7,574,710; 8,589,610; 8,635,185; and 11,200,240.
[5] *See e.g.*, U.S. Patent Nos. 7,743,003; 8,458,327; 9,166,864; 9,665,617; and 10,733,376.
[6] *See e.g.*, U.S. Patent Nos. 7,636,323; 8,448,214; 9,083,986; 9,357,269; and 10,091,528.
[7] *See e.g.*, U.S. Patent Nos. 7,656,800; 7,930,734; 8,339,954; 9,350,822; and 10,284,484.
[8] *See e.g.*, U.S. Patent Nos. 7,519,353; 8,315,179; 8,989,002; 10,511,533; and 11,233,740.
[9] *See e.g.*, U.S. Patent Nos. 7,394,809; 7,408,932; 9,515,942; 9,923,821; and 10,644,961.
[10] *See e.g.*, U.S. Patent Nos. 8,248,944; 9,071,841; 9,852,118; 10,452,748; and 11,055,47.
[11] *See e.g.*, U.S. Patent Nos. 8,065,374; 8,429,302; 9,558,293; 9,800,638; and 10,491,645.
[12] *See e.g.*, U.S. Patent Nos. 8,149,706; 8,930,559; 9,253,231; 10,003,697; and 10,193,942.
[13] *See e.g.*, U.S. Patent Nos. 8,112,800; 8,509,071; 8,948,174; 9,407,726; and 11,228,631.

States of the Accused Products defined below. Alphabet has a registered agent to accept service of process within the State of Delaware located at Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

12. On information and belief, Defendant has used, sold, or offered to sell products and services, including the Accused Products defined herein, in the State of Delaware.

JURISDICTION AND VENUE

13. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338(a).

14. This Court has personal jurisdiction over Google in this action because Google has committed acts within the District of Delaware giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Google would not offend traditional notions of fair play and substantial justice. Google, directly and/or through subsidiaries or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the patents-in-suit. Moreover, Google is registered to do business in the State of Delaware and actively directs its activities to customers located in the State of Delaware.

15. Venue is proper in this District under 28 U.S.C. §§ 1391(b)-(d) and 1400(b). Alphabet Inc. and Google LLC are both organized under the laws of the State of Delaware.

16. This Court has personal jurisdiction over Alphabet Inc. and Google LLC because they are organized under the laws of the State of Delaware and they maintain a registered agent in Delaware.

THE ASSERTED PATENTS

U.S. PATENT NO. 7,099,273

17. U.S. Patent No. 7,099,273 (the "'273 patent") entitled, *Data Transport Acceleration and Management Within a Network Communication System*, was filed on January 29, 2002. The '273 patent is subject to a 35 U.S.C. § 154(b) term extension of 1,021 days. The '273 patent claims priority to U.S. Provisional Patent Application No. 60/309,212 filed on July 31, 2001, and U.S. Provisional Patent Application No. 60/283,542 filed on April 12, 2001. A true and correct copy of the '273 patent is attached hereto as Exhibit 1.

18. The '273 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '273 patent.

19. The technologies disclosed in the '273 patent improve the efficiency and speed of data transmission within network communication systems. The '273 patent introduces methods and apparatuses that enhance data transport, especially in environments where network conditions are variable or unpredictable and "provide systems and method for data transport acceleration and management within a network communication system." '273 patent, col. 3:31-33.

20. The '273 patent is directed to solving the problem of inefficient data transport within network communication systems. This inefficiency can lead to poor utilization of network resources, increased latency, and reduced overall performance.

21. The '273 patent identifies the shortcomings of the prior art. Specifically, the specification describes that traditional methods of data transport in network communication systems often fail to efficiently manage and accelerate data transport, especially in environments with variable or unpredictable network conditions. These methods may not adequately handle network congestion, leading to poor utilization of network resources, increased latency, and

reduced overall performance. "This bursty nature of data transmission may under-utilize the available bandwidth on the downlink channel, and may cause some applications requiring a steady flow of data, such as audio or video, to experience unusually poor performance." '273 patent, col. 2:1-6.

22. The '273 patent identifies several shortcomings of the prior art, particularly in the context of the Transport Control Protocol (TCP) which is commonly used in modern data communication networks. The patent specification describes that:

> Many of the problems associated with conventional TCP architectures stem from the flow control, congestion control and error recovery mechanisms used to control transmission of data over a communication network.

'273 patent, col. 1:38-41.

23. Conventional TCP architectures assume that the network employs symmetric communication channels that enable data packets and acknowledgements to be equally spaced in time. This assumption often does not hold true in networks that employ asymmetric uplink and downlink channels, such as wireless communication networks. Bursty data transmission might result in the inefficient use of the available bandwidth on the downlink channel, leading to suboptimal performance in applications that need a consistent data flow, such as those involving audio or video.

24. Another shortcoming identified is that conventional TCP architectures react to both random loss and network congestion by significantly and repeatedly reducing the congestion window, which can lead to significant and potentially unjustified deterioration in data throughput. This is particularly problematic in wireless and other bandwidth constrained networks where random packet loss due to fading, temporary degradation in signal quality, signal handoffs or large propagation delays occur with relatively high frequency.

25. The ‘273 patent also points out that conventional TCP congestion control mechanisms tend to exhibit sub-optimal performance during initialization of data connections over reduced-bandwidth channels, such as wireless links. When a connection is initiated, the congestion control mechanism aggressively increases the size of the congestion window until it senses a data packet loss. This process may adversely impact other connections that share the same reduced-bandwidth channel as the connection being initialized attempts to maximize its data throughput without regard of the other pre-existing connections. This can lead to inefficient use of resources with decreased overall throughput.

26. The ‘273 patent teaches the use of various techniques to accelerate and manage data transport in network communication systems. These techniques include the use of congestion control mechanisms, timers, and other methods to optimize data transmission. By implementing these techniques, the patent aims to improve the efficiency of data transport, particularly in environments with variable or unpredictable network conditions. This can lead to better utilization of network resources, reduced latency, and improved overall performance. The inventions disclosed in the ‘273 patent provide significant benefits and improvements to the function of the hardware in a computer network.

27. The ‘273 patent family has been cited by 1,466 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the ‘273 patent family as relevant prior art:

- Cisco Technology, Inc.
- Qualcomm Incorporated
- International Business Machines Corporation
- Intel Corporation
- Microsoft Corporation
- Broadcom Corporation
- ***Google Inc.***
- F5 Networks, Inc.

- Adobe Systems Incorporated
- Apple Inc.
- Lumen Technologies, Inc
- Oracle Corporation
- Amazon.com, Inc.

U.S. PATENT NO. 7,444,418

28. U.S. Patent No. 7,444,418 (the "'418 patent") entitled, *Transcoding Multimedia Information Within a Network Communication System*, was filed on May 9, 2002. The '418 patent claims priority to Provisional Application No. 60/290,269, which was filed on May 11, 2001. The '418 patent is subject to a 35 U.S.C. § 154(b) term extension of 766 days. A true and correct copy of the '418 patent is attached hereto as Exhibit 2.

29. The '418 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '418 patent.

30. The '418 patent describes a method for transcoding multimedia information, which involves intercepting the multimedia data transmitted between a sender and a receiver. "Embodiments of the present invention alleviate many of the foregoing problems by providing systems and methods for transcoding multimedia information within a network communications system." '418 patent, col. 2:45-48.

31. The '418 patent is directed to solving the problem of transmitting multimedia information over network communication systems, particularly in scenarios where the transmission rate at which the multimedia information is encoded is greater than the available transmission rate. "As a result, these bandwidth constrained networks are susceptible to a mismatch between the required transmission rate of the multimedia information and the available transmission rate of the communication channel." '418 patent, col. 1:56-60. This problem is

especially pronounced in wireless and other bandwidth-constrained networks, which have physical limitations on the maximum bandwidth that the communication channel can support.

32. The inventions disclosed in the '418 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling more efficient transmission of multimedia information. By transcoding the multimedia information to match the available transmission rate of the downlink channel, the '418 patent teaches methods that prevent the receiver from being overloaded with data transmitted at a rate higher than it can handle. This can help to prevent disruptions and degradation in the performance of multimedia applications, leading to a better functioning of computer hardware.

33. The '418 patent family has been cited by 166 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '418 patent family as relevant prior art:

- Apple, Inc.
- Verizon Communications Inc.
- Siemens Ag
- Microsoft Corporation
- Cisco Systems, Inc.
- ***Alphabet Inc.***
- Amazon.com, Inc.
- Broadcom Limited
- Qualcomm, Inc.
- Koninklijke Philips Nv

U.S. PATENT NO. 7,031,314

34. U.S. Patent No. 7,031,314 (the "'314 patent") entitled, *Systems and Methods for Providing Differentiated Services Within a Network Communication System*, was filed on April 19, 2002. The '314 patent claims priority to U.S. Provisional Patent Application No. 60/291,918, which was filed on May 16, 2001, and U.S. Provisional Patent Application No. 60/309,213 filed

on July 31, 2001. The '314 patent is subject to a 35 U.S.C. § 154(b) term extension of 625 days. A true and correct copy of the '314 patent is attached hereto as Exhibit 3.

35. The '314 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '314 patent.

36. The '314 patent is directed to solving the problem of deploying differentiated services within existing network infrastructure. The patent identifies that existing network infrastructure was generally not designed to support a wide variety of application-specific and subscriber-specific services as the corresponding data flowed through a network. "Consequently, the different and potentially incompatible requirements of the increasingly diverse applications, Subscribers and networking environments has placed demands on the existing network infrastructure for which the network infrastructure was not originally designed to handle." '314 patent, col. 1:37-42.

37. The '314 patent addresses the issue of identifying the data streams on which to perform the differentiated services, which may involve a significant processing penalty. "The problem with deploying these differentiated services within the existing network infrastructure is that the network infrastructure was not designed to support a wide variety application-specific and subscriber specific services as the corresponding data flows through the network." '314 patent, col. 1:47-52.

38. The inventions disclosed in the '314 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling differentiated services within the network infrastructure. By incorporating a service module within the network infrastructure that can intercept packets, determine whether the connection corresponds to a service

application, and then break and reestablish the connection for application-specific processing, the invention allows for a more efficient and flexible network communication system.

39. The inventions taught by the '314 patent solves discrete, technological problems associated with computer systems, specifically those related to network communication systems. The patent addresses the limitations of existing network infrastructures that were not designed to support a wide variety of application-specific and subscriber-specific services as data flows through the network. It also solves the problem of the significant processing penalty associated with identifying the data streams on which to perform the differentiated services.

40. The '314 patent family has been cited by 1,466 United States and international patents and patent applications as relevant prior art. Specifically, 141 United States and international patents and patent applications have cited the '314 patent itself as relevant prior art. The following companies and research institutions have cited the '314 patent as relevant prior art:

- Cisco Technology, Inc.
- ***Alphabet Inc.***
- Oracle Corporation
- International Business Machines Corp.
- Microsoft Corporation
- Qualcomm, Inc.
- Telefonaktiebolaget Lm Ericsson
- Intel Corporation
- Check Point Software Technologies Ltd.
- Hitachi, Ltd.
- Open Text Corporation
- Fujitsu Limited
- Broadcom Limited
- Samsung Electronics Co., Ltd.

U.S. PATENT NO. 7,586,871

41. U.S. Patent No. 7,586,871 (the "'871 patent") entitled, *Platform and Method for Providing Data Services in a Communication Network*, was filed on January 11, 2006. The '871

patent claims priority to U.S. Application Ser. No. 10/061,953, which was filed on February 2, 2002, which claims the benefit of U.S. Provisional Applications No. 60/292,564, which was filed on May 22, 2001, and No. 60/293,756, which was filed on May 25, 2001. The '871 patent also claims the benefit of U.S. Provisional Application No. 60/654,730, which was filed on February 18, 2005. The '871 patent is subject to a 35 U.S.C. § 154(b) term extension of 748 days. A true and correct copy of the '871 patent is attached hereto as Exhibit 4.

42. The '871 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '871 patent.

43. The '871 patent generally relates to a communication node and corresponding method for processing data communications passing through the node between a first data network and a second data network. The method includes detecting an event associated with data communication arriving at the node from the first data network, determining whether the data communication is to be suspended for service at the node based on the detected event, and processing suspended data communication based on information in the data communication. The patent also covers the detection of return data communication arriving at the node from the second data network in response to the processed data communication from the first data network. The detected return data communication is allowed to pass through the node without processing the detected return data communication.

44. The '871 patent is directed to solving the problem of efficiently providing data services, such as content filtering, in a communication network. This includes the ability to determine whether a packet flow should be suspended for filtering a content request based on packet flow characteristics detected at the layers implemented in hardware, without the need for assistance from higher layers in the architecture implemented in software.

45. The ‘871 patent teaches the use of a communication node that processes data communication between two networks. This node detects an event associated with data communication from the first network, determines whether the data communication should be suspended for service at the node based on the detected event, and processes suspended data communication based on information in the data communication. The ‘871 patent also teaches the detection of return data communication from the second network in response to the processed data communication from the first network, allowing this return data communication to pass through the node without further processing. This approach allows for more efficient processing of data communication, reducing the need to inspect every packet in a flow and avoiding the need to terminate or establish a communication session associated with the data communication.

46. The inventions disclosed in the ‘871 patent provide significant benefits and improvements to the function of the hardware in a computer network. Specifically, the inventions taught by the ‘871 patent can determine whether a packet flow should be suspended for filtering a content request based on packet flow characteristics detected at the layers implemented in hardware. This improves the efficiency and scalability of content filtering and other services, particularly for mobile data networks that carry delay-sensitive traffic such as voice or video streaming traffic.

47. The ‘871 patent family has been cited by 962 United States and international patents and patent applications as relevant prior art. 166 United States and international patents and patent applications have cited the ‘871 patent itself as relevant prior art. The following companies and research institutions have cited the ‘871 patent as relevant prior art:

- A10 Networks, Inc.
- Thoma Bravo, LLC
- AT&T, Inc.
- NEC Corporation

- Nokia Corporation
- Cisco Systems, Inc.
- Juniper Networks, Inc.
- Fujitsu Limited

U.S. PATENT NO. 7,616,559

48. U.S. Patent No. 7,616,559 (the "'559 patent") entitled, *Multi-Link Network Architecture, Including Security, In Seamless Roaming Communications Systems And Methods*, was filed on September 2, 2004. The '559 patent claims priority to Provisional Application No. 60/499,648, which was filed on September 3, 2003. The '559 patent is subject to a 35 U.S.C. § 154(b) term extension of 638 days. A true and correct copy of the '559 patent is attached hereto as Exhibit 5.

49. The '559 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '559 patent.

50. The '559 patent generally relates to a communications system that provides secure communications of information over multiple communication links. This system includes a client device, a server device, and at least one communication channels, elements, modes, and links for connecting the devices for communication of information between them. The system includes a link detector for determining the existence and usability of the communication links for communication of the information, a pathfinder for selecting one or more of the communication links for communication of at least some of the information, a link handover for switching to the selected one or more communication links for communication of the information or portion thereof, and an auto reconnector for re-connecting to detected and selected one or more communication links for communication of the information or portions of it in the event that any communication is hindered, terminated, or upset.

51. The ‘559 patent is directed to solving the problem of ensuring secure and reliable communication over multiple communication links, especially in environments that include mobile or other roaming devices capable of communicating over multiple channels and with channel switching characteristics.

52. The ‘559 patent identifies the shortcomings of the prior art. Specifically, the specification describes that when multiple links, both physical elements and the bands or channels within each such element, are employed for communications in data networks, substantial coordination of communicated information, as well as security of the information, is exponentially complicated. In wireless communications, concurrent or sequential operations can occur over cellular or wireless LAN technologies. Each of these wireless communications methods experiences substantially greater complexity in timing, security, packet sequencing, data loss, and connectivity, over wired communications conditions.

53. The ‘559 patent teaches the use of a system that includes a link detector for determining the existence and usability of the communication links for communication of the information, a pathfinder for selecting one or more of the communication links for communication of at least some of the information, a link handover for switching to the selected one or more communication links for communication of the information or portion thereof, and an auto reconnector for re-connecting to detected and selected one or more communication links for communication of the information or portions of it in the event that any communication is hindered, terminated, or upset.

54. The inventions disclosed in the ‘559 patent provide significant benefits and improvements to the function of the hardware in a computer network by ensuring secure and reliable communication over multiple communication links. This is particularly beneficial in

environments that include mobile or other roaming devices capable of communicating over multiple channels and with channel switching characteristics. The system's ability to detect usable communication links, select the most suitable ones, switch between them as needed, and reconnect in the event of communication disruption greatly enhances the reliability and efficiency of data transmission in a computer network.

55. The '559 patent family has been cited by 17 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '559 patent family as relevant prior art:

- International Business Machines Corporation
- Samsung Electronics Co., Ltd
- ***Alphabet Inc.***
- Research In Motion Limited
- BT Group plc

U.S. PATENT NO. 9,275,167

56. U.S. Patent No. 9,275,167 (the "'167 patent") entitled, *Content Adaptation*, was filed on May 14, 2012. The '167 patent claims priority to U.S. Provisional Patent Application No. 11/636,033, which was filed on December 8, 2006. The '167 patent is subject to a 35 U.S.C. § 154(b) term extension of 607 days. A true and correct copy of the '167 patent is attached hereto as Exhibit 6.

57. The '167 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '167 patent.

58. The '167 patent is directed to solving the problem of efficient data management in a distributed storage system. In distributed storage systems, data is spread across multiple nodes, which can be geographically dispersed. This presents challenges in terms of ensuring data availability, redundancy, and efficient retrieval. The '167 patent addresses these shortcomings in

existing systems by providing methods and systems that can manage data in a distributed storage system more effectively.

59. The ‘167 patent identifies the shortcomings of the prior art. The specification describes that traditional methods of data management in distributed storage systems often suffer from inefficiencies and limitations. For instance, they may not provide sufficient data redundancy, which can lead to data loss if a node fails. Additionally, they may not distribute data evenly across the nodes, leading to some nodes being overloaded while others are underutilized. Furthermore, data retrieval can be slow and inefficient in these systems.

60. The inventions taught by the ‘167 patent solves discrete, technological problems associated with computer systems, specifically those related to data management in distributed storage systems. These are technical problems because they involve the design and operation of computer systems, including how data is stored, distributed, and retrieved in a network of computers.

61. The ‘167 patent family has been cited by 539 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the ‘167 patent family as relevant prior art:

- Cisco Systems, Inc.
- Microsoft Corporation
- International Business Machines Corp.
- Amazon.com, Inc.
- ***Alphabet Inc.***
- Meta Platforms, Inc.
- Apple Inc.
- Broadcom Limited
- Xerox Corporation
- Samsung Electronics Co., Ltd.
- AT&T Inc.
- NEC Corporation
- Telefonaktiebolaget LM Ericsson
- Verizon Communications Inc.

- Qualcomm, Inc.
- Brunoco, Inc.
- Nokia Corporation
- LG Electronics Inc.
- Adobe Inc.
- Oracle Corporation
- Fujitsu Limited

U.S. PATENT NO. 9,191,664

62. U.S. Patent No. 9,191,664 (the "'664 patent") entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on November 11, 2013. The '664 patent claims priority to U.S. Provisional patent Application No. 60/948,917, which was filed on July 10, 2007. A true and correct copy of the '664 patent is attached hereto as Exhibit 7.

63. The '664 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '664 patent.

64. The '664 patent is generally directed to adaptive bitrate management for streaming media over packet networks. Specifically, it aims to solve the problem of delivering multimedia content over capacity-limited, shared wireless links. Challenges like sudden bandwidth fluctuations, packet loss, reduction in effective capacity, and limited total bitrate budgets make consistent high-quality streaming difficult over wireless networks. Further, the '664 patent teaches ways to quickly respond to changes in network conditions by adjusting the bitrate and the media encoding scheme to optimize the viewing and listening experience of the user. It addresses the issue of transferring a fixed bitrate over a connection that cannot provide the necessary throughput, which can lead to undesirable effects such as network buffer overflow, packet loss, and media player buffer underflow.

65. The prior art has several shortcomings that the '664 patent identifies. Specifically, existing protocols for rate control in media streaming over packet networks were not fully

equipped to handle the challenges posed by wireless networks. These challenges include sudden adjustments of nominal transmission rate, packet loss, reduction of effective bandwidth, and limited capacity.

66. To address these issues, the '664 patent teaches in one embodiment an adaptive bitrate manager that monitors feedback information to estimate network conditions. The media is encoded according to the optimal bitrates and provided as encoded streams for transmission.

67. Several benefits and improvements to computer network functionality are provided by the inventions disclosed in the '664 patent. Quickly responding to changes in available network bandwidth allows maintaining consistent streaming quality. Encoding audio and video based on network estimations optimizes the media performance within constrained wireless capacity. Avoiding underflows and overflows through bitrate adaptation enables stable streaming.

68. The '664 patent solves technical problems rooted in streaming multimedia over wireless networks. Challenges like packet loss and volatile transmission rates present discrete technological issues. The '664 patent teaches specific techniques for dynamic adaptation of media encoding in response to feedback-based network estimates. This constitutes an improvement to computer network technology by addressing these streaming challenges.

69. The '664 patent family has been cited by 357 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '664 patent family as relevant prior art:

- ***Alphabet Inc.***
- Oracle Corporation
- AT&T Inc.
- Telefonaktiebolaget LM Ericsson
- International Business Machines Corp.
- Microsoft Corporation
- Cisco Systems, Inc.
- DISH Network Corp.

- Broadcom Limited
- Amazon.com, Inc.
- Adobe Inc.
- Samsung Electronics Co., Ltd.
- Comcast Corporation
- Canon Inc.
- Technicolor S.A.
- Qualcomm, Inc.
- CommScope, Inc.
- Intel Corporation
- Meta Platforms, Inc.
- Hitachi, Ltd.
- Verizon Communications Inc.

U.S. PATENT NO. 7,987,285

70. U.S. Patent No. 7,987,285 (the "'285 patent") entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on July 9, 2008. The '285 patent claims priority to U.S. Provisional Application No. 60/948,917, which was filed on July 10, 2007. The '285 patent is subject to a 35 U.S.C. § 154(b) term extension of 105 days. A true and correct copy of the '285 patent is attached hereto as Exhibit 8.

71. The '285 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '285 patent.

72. The '285 patent relates to adaptive bitrate management for streaming media over packet networks. It teaches a method that includes receiving a receiver report from a terminal, estimating network conditions of a media network based on the receiver report, determining an optimal session bitrate based on the estimated network conditions, and providing media data to the terminal based on the optimal session bitrate.

73. The '285 patent is directed to solving the problem of delivering bandwidth-intensive content like multimedia over capacity-limited, shared links, particularly in wireless networks. The challenge is to quickly respond to changes in network conditions by adjusting the

bitrate and media encoding scheme to optimize the user's viewing and listening experience. This includes addressing issues like network buffer overflow, packet loss, playback stall, sudden adjustment of nominal transmission rate, packet loss due to link transmission errors or network congestion, reduction of effective bandwidth, and limited capacity in wireless networks.

74. The '285 patent identifies the shortcomings of the prior art. Specifically, existing rate control protocols and recommendations were insufficient for delivering multimedia sessions over wireless networks. Issues included sudden adjustments in nominal transmission rates, packet loss, reduction of effective bandwidth, limited capacity, infrequent and incomplete network state information, handling different media streams separately, and low bitrates available for wireless multimedia sessions. These challenges made it difficult to set up a consistent streaming media session.

75. The inventions disclosed in the '285 patent provide significant benefits and improvements to the function by enabling more efficient and responsive control over the bitrate of streaming media sessions according to instantaneous network capacity. This leads to better user experience in streaming media over wireless packet networks, minimizing issues like buffer overflow, packet loss, and playback stall. The adaptive bitrate management system can work with existing media players and networks, providing a more robust and flexible solution for streaming media, especially in challenging wireless environments.

76. The inventions disclosed in the '285 patent solve discrete, technological problems associated with computer systems, particularly in the context of streaming media over packet networks. These problems include managing bitrate in fluctuating network conditions, handling different types of media streams, optimizing the viewing and listening experience, and addressing specific challenges in wireless networks such as interference, fading, link transmission errors,

network congestion, and limited capacity. The patent provides technical solutions through adaptive bitrate management, network state estimation, control algorithms, and specific encoding and packetization methods.

77. The '285 patent family has been cited by 357 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '285 patent family as relevant prior art:

- ***Alphabet Inc.***
- Cisco Systems, Inc.
- Nokia Corporation
- Tencent Holdings Ltd.
- Hitachi Ltd.
- Oracle Corporation
- Microsoft Corporation
- DISH Network Corp.
- Broadcom Limited
- Amazon.com, Inc.
- Samsung Electronics Co., Ltd.
- Comcast Corporation
- Canon Inc.
- Qualcomm, Inc.
- CommScope, Inc.
- Intel Corporation
- Meta Platforms, Inc.
- Verizon Communications Inc.

U.S. PATENT NO. 7,991,904

78. U.S. Patent No. 7,991,904 (the "'904 patent") entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on March 31, 2009. The '904 patent claims priority to U.S. Provisional Patent Application No. 60/948,917, which was filed on July 10, 2007. The '904 patent is subject to a 35 U.S.C. § 154(b) term extension of 39 days. A true and correct copy of the '904 patent is attached hereto as Exhibit 9.

79. The ‘904 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the ‘904 patent.

80. The ‘904 patent relates to adaptive bitrate management for streaming media over packet networks. The patent includes a comprehensive framework for adjusting the bitrate of streaming media sessions according to instantaneous network capacity, particularly in wireless packet networks.

81. The ‘904 patent is directed to solving the problem of rate control for media streaming over packet networks, particularly in wireless environments. The challenge lies in delivering bandwidth-intensive content like multimedia over capacity-limited, shared links and quickly responding to changes in network conditions. The patent addresses issues such as network buffer overflow, packet loss, playback stall, and challenges in implementing bitrate management for pseudo-streaming.

82. The ‘904 patent identifies the shortcomings of the prior art. Specifically, existing mechanisms for multimedia transport over packet networks, such as streaming protocols (e.g., RTP) and pseudo-streaming (e.g., TCP), had limitations. For example, TCP’s acknowledgment packets are unaware of the media time being transferred, making it difficult to implement a bitrate management algorithm for pseudo-streaming. The prior art also lacked efficient solutions for challenges encountered in delivering multimedia sessions over packet wireless networks, such as sudden adjustments in transmission rate, packet loss, reduction of effective bandwidth, and limited capacity.

83. The inventions disclosed in the ‘904 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling adaptive bitrate management for streaming media. This allows for more efficient utilization of network resources,

minimizes issues like buffer overflow and packet loss, and enhances the user experience by optimizing the viewing and listening experience. The patent's approach to adaptive bitrate management can be applied to various media transports and provides a comprehensive framework for delivering streaming media over wireless packet networks, particularly in fluctuating network conditions.

84. The '904 patent family has been cited by 357 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '904 patent family as relevant prior art:

- Oracle Corporation
- Microsoft Corporation
- Comcast Corporation
- ***Alphabet Inc.***
- International Business Machines Corp.
- Hitachi, Ltd.
- Electronics And Telecommunications Research Institute
- EchoStar Technologies LLC
- Amazon Technologies, Inc.
- Samsung Electronics Co., Ltd.
- Qualcomm, Inc.
- CommScope, Inc.
- Intel Corporation
- Meta Platforms, Inc.
- Verizon Communications Inc.
- Broadcom Limited

U.S. PATENT NO. 8,230,105

85. U.S. Patent No. 8,230,105 (the "'105 patent") entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on July 25, 2011. The '105 patent is a continuation of U.S. Patent Application No. 12/170,347, which was filed July 9, 2008 and issued as U.S. Patent No. 7,987,285, and which claims the benefit of U.S. Provisional Application No. 60/948,917, which was filed July 10, 2007. A true and correct copy of the '105 patent is attached hereto as Exhibit 10.

86. The ‘105 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the ‘105 patent.

87. The ‘105 patent relates to a method for adaptive bitrate management in streaming media over packet networks. It discloses receiving a receiver report from a terminal, estimating network conditions based on the report, determining an optimal session bitrate according to the estimated network conditions, and providing media data to the terminal based on the optimal session bitrate. The patent emphasizes the need for rate control in delivering bandwidth-intensive content like multimedia over capacity-limited, shared links, and the challenges faced in wireless networks.

88. The ‘105 patent is directed to solving the problem of delivering consistent and optimized streaming media sessions over packet networks, particularly in wireless networks. The challenges include sudden adjustments in nominal transmission rates, packet loss, reduction of effective bandwidth, limited capacity, and difficulties in setting up a consistent streaming media session.

89. The ‘105 patent identifies the shortcomings of the prior art. Specifically, existing protocols and methods were inadequate in handling network buffer overflow, playback stall, interference, fading, and other challenges in wireless networks. The existing solutions were not efficient in responding to changes in network conditions, and the typical wireless media player support was limited and sporadic, leading to difficulties in providing a good streaming experience.

90. The ‘105 patent teaches the use of adaptive bitrate management, which includes an adaptive bitrate controller and a variable bitrate encoder. This framework enables the delivery of self-adjusting streaming sessions to media players, such as standard 3GPP-compliant media players. It adjusts the bitrate according to instantaneous network capacity, optimizes performance

by adjusting the streaming media bitrate, and implements joint session bitrate management for audio, video, and other streams simultaneously.

91. The inventions disclosed in the '105 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling more efficient and adaptive control of streaming media sessions. By dynamically adjusting the bitrate according to network conditions, the invention minimizes issues like buffer overflow, packet loss, and playback stall. It enhances the user's viewing and listening experience, particularly in wireless networks where traditional methods were inadequate.

92. The inventions taught by the '105 patent solves discrete, technological problems associated with computer systems and networks, particularly in the context of streaming media over packet networks. These problems include network buffer management, bitrate optimization, handling of packet loss, and adjustments to sudden changes in network conditions. The invention addresses these technical challenges through a comprehensive framework that adapts to the network's instantaneous capacity, ensuring a consistent and optimized streaming experience.

93. The '105 patent family has been cited by 357 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '105 patent family as relevant prior art:

- Amazon.com, Inc.
- Hulu LLC
- Tencent Holdings Ltd.
- Cisco Systems, Inc.
- Oracle Corporation
- Microsoft Corporation
- Comcast Corporation
- ***Alphabet Inc.***
- International Business Machines Corp.
- Hitachi, Ltd.
- Electronics And Telecommunications Research Institute
- EchoStar Technologies LLC

- Samsung Electronics Co., Ltd.
- Qualcomm, Inc.
- CommScope, Inc.
- Intel Corporation
- Meta Platforms, Inc.
- Verizon Communications Inc.
- Broadcom Limited

U.S. PATENT NO. 8,769,141

94. U.S. Patent No. 8,769,141 (the "'141 patent") entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on March 14, 2013. The '141 patent is a continuation of U.S. Application Ser. No. 13/183,317, which was filed July 14, 2011 and issued as U.S. Patent No. 8,255,551, which is a continuation of U.S. Patent Application No. 12/416,085, which was filed March 31, 2009 and issued as U.S. Patent No. 7,991,904, which is a continuation-in-part of U.S. Patent Application No. 12/170,347, which was filed July 9, 2008 and issued as U.S. Patent. No. 7,987,285, which claims the benefit of U.S. Provisional Application No. 60/948,917, which was filed July 10, 2007. A true and correct copy of the '141 patent is attached hereto as Exhibit 11.

95. The '141 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '141 patent.

96. The '141 patent discloses a method for adaptive bitrate management in streaming media over packet networks. It includes providing pseudo-streaming media data to a terminal, receiving a TCP acknowledgment, estimating network conditions based on the acknowledgment, determining an optimal session bitrate, and providing pseudo-streaming media data based on the optimal bitrate. The patent encompasses a comprehensive framework that enables the delivery of self-adjusting streaming or pseudo-streaming sessions to media players, such as standard 3GPP-compliant media players or Flash plugins used for web-embedded video.

97. The ‘141 patent is directed to solving the problem of rate control for media streaming over packet networks, particularly in bandwidth-limited and shared links. The challenge is to quickly respond to changes in network conditions by adjusting the bitrate and media encoding scheme to optimize the user’s viewing and listening experience. The patent addresses issues like network buffer overflow, packet loss, playback stall, and the challenges encountered in delivering multimedia sessions over packet wireless networks.

98. The inventions disclosed in the ‘141 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling adaptive bitrate management. This ensures optimal user experience by dynamically adjusting the bitrate according to network conditions. It minimizes undesirable effects like packet loss, buffer overflow, and playback stall. The system’s ability to implement joint session bitrate management for audio, video, and other streams simultaneously, and its applicability to all media transports that provide transmission progress report mechanisms, make it a versatile solution.

99. The ‘141 patent family has been cited by 357 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the ‘141 patent family as relevant prior art:

- ***Alphabet Inc.***
- Oracle Corporation
- AT&T Inc.
- Telefonaktiebolaget LM Ericsson
- International Business Machines Corp.
- Microsoft Corporation
- Cisco Systems, Inc.
- DISH Network Corp.
- Broadcom Limited
- Amazon.com, Inc.
- Adobe Inc.
- Samsung Electronics Co., Ltd.
- Comcast Corporation
- Canon Inc.

- Technicolor S.A.
- Qualcomm, Inc.
- CommScope, Inc.
- Intel Corporation
- Meta Platforms, Inc.
- Hitachi, Ltd.
- Verizon Communications Inc.

U.S. PATENT NO. 10,412,388

100. U.S. Patent No. 10,412,388 (the "'388 patent") entitled, *Framework for Quality-Aware Video Optimization*, was filed on January 8, 2018. The '388 patent claims priority to U.S. Patent Application No. 12/751,951, which was filed on March 31, 2010, and which claims priority to U.S. Provisional Patent Application No. 61/165,224, which was filed on March 31, 2009. A true and correct copy of the '388 patent is attached hereto as Exhibit 12.

101. The '388 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '388 patent.

102. The '388 patent generally relates to a method and system for quality-aware video optimization. It teaches receiving an encoded video frame, decompressing it, extracting a first quantization parameter (QP), and acquiring a delta QP based on the first QP. The method also includes acquiring a second QP based on the delta QP and the first QP, compressing the decompressed video frame based on the second QP, and providing the compressed video frame. The process allows for fine control of quality degradation in byte-reduced content and can be applied to transcoding scenarios where the input and output compression formats are different.

103. The '388 patent identifies the shortcomings of the prior art. Specifically, existing single-pass rate control techniques had a problem in that the relationship between the compressed byte size of a video frame and its quantization parameter were only known after the frame is

encoded. This made it challenging to achieve byte reduction and controllable quality degradation in a single pass.

104. The '388 patent teaches the use of a quality-aware video optimization technique that modifies a video frame sequence to reduce the byte size while limiting perceptual quality degradation to a controllable level.

105. The inventions disclosed in the '388 patent provide significant benefits and improvements to the function of hardware in a computer network by enabling efficient video optimization. The method allows for single-pass, on-the-fly quality-aware optimization, making it well-suited for various environments, including live video feeds and storage arrays.

106. The '388 patent family has been cited by 30 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '388 patent family as relevant prior art:

- Interdigital, Inc.
- Tencent Holdings Ltd
- Microsoft Corporation
- Qualcomm, Inc.
- Lattice Semiconductor
- Openwave Mobility, Inc.
- Samsung Electronics Co., Ltd.
- Beijing Dajia Interconnection Information Technology Co., Ltd.

U.S. PATENT NO. 8,429,169

107. U.S. Patent No. 8,429,169 (the "'169 patent") entitled, *Systems and Methods For Video Cache Indexing*, was filed on July 29, 2011. The '169 patent claims priority to U.S. Provisional Patent Application No. 61/369,513, which was filed on July 30, 2010. A true and correct copy of the '169 patent is attached hereto as Exhibit 13.

108. The '169 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '169 patent.

109. The ‘169 patent is directed to solving the problem of inefficient caching of content, particularly when dynamic URLs are used to refer to the content. Traditional caching methods that index content based on URLs can lead to multiple cache entries for the same content or entries with expired references, reducing the efficiency and capacity of the cache. The technologies taught in the ‘169 patent overcomes these inefficiencies by indexing the content cache based on a characterization of the content rather than the URL.

110. The ‘169 patent identifies the shortcomings of the prior art. Specifically, that conventional content caching methods, especially those employing dynamic URLs, lead to two main inefficiencies: (a) multiple cache entries corresponding to the same video content, thereby reducing the cache’s capacity to serve unique content, and (b) content cache entries with expired references to content, reducing the useful capacity of the content cache. These inefficiencies hinder the performance of middleware services and website performance.

111. The ‘169 patent teaches the use of a novel approach to cache video content by indexing the content cache based on a characterization of the video content rather than the URL. This method involves identifying characterization data related to the content request and using a hash function to generate an index. This index is then used to identify the corresponding entry in the cache data structure. By avoiding the use of dynamic URLs in the indexing process, the patent’s method allows for more efficient caching, eliminating redundancies and invalid entries, and improving the overall efficiency of content delivery.

112. The inventions disclosed in the ‘169 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling more efficient caching of video content. By indexing the content cache based on the characterization of the content rather than the URL, the patented method avoids the problems of redundant and invalid

cache entries. This leads to better utilization of cache capacity, reduced burden on network infrastructure and web servers, and faster content delivery to users. The invention also allows for distinguishing between similar but non-identical videos, avoiding content aliasing, and ensuring that the correct content is delivered to the user.

113. The '169 patent family has been cited by 92 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '169 patent family as relevant prior art:

- Akamai Technologies, Inc.
- AMC Networks Inc.
- AT&T Inc.
- Atlassian Pty Ltd
- Canon Inc.
- Charter Communications, Inc.
- China Mobile Communications Corporation
- EchoStar Corporation
- Huawei Investment & Holding Co., Ltd.
- Interdigital, Inc.
- Juniper Networks, Inc.
- Koninklijke Philips Nv
- Microsoft Corporation
- Open Text Corporation
- SK Telecom Co., Ltd.
- Skyfire Labs, Inc., California
- ZTE Corporation

U.S. PATENT NO. 9,167,021

114. U.S. Patent No. 9,167,021 (the "'021 patent") entitled, *Measuring Web Browsing Quality of Experience in Real-Time at An Intermediate Network Node*, was filed on March 30, 2012. The '021 patent is subject to a 35 U.S.C. § 154(b) term extension of 265 days. A true and correct copy of the '021 patent is attached hereto as Exhibit 14.

115. The '021 patent has been in full force and effect since its issuance. OptiMorphix, Inc. owns by assignment the entire right, title, and interest in and to the '021 patent.

116. The ‘021 patent is directed to solving the problem of accurately measuring the time needed to download a web page at an intermediate network node. Traditional methods of measuring download time at the client or server level are straightforward, but complications arise when content for a single web page is distributed across several physical servers or when measuring at an intermediate network node. The patent addresses these challenges by introducing a method to evaluate and compute the page unit time.

117. The ‘021 patent identifies the shortcomings of the prior art. Specifically, measuring the web page download time at an intermediate network node is practically not feasible due to the complexity of web page transactions. The prior art lacks an effective method to measure the time taken to download a complete web page at an intermediate network node, especially when content is distributed across several servers or when dynamic URLs are generated by client-side scripts.

118. The ‘021 patent teaches the use of a method that includes acquiring current HTTP transactions, determining their relation to web browsing for a specific client, and evaluating whether they belong with the previous transactions set. By grouping transactions into page units and computing a page unit time, the method provides a way to measure the Quality of Experience (QoE) of web browsing in real-time at an intermediate network node.

119. The inventions disclosed in the ‘021 patent provide significant benefits and improvements to the function of the hardware in a computer network by enabling real-time measurement of web browsing QoE at an intermediate network node. This allows service providers to optimize network performance and take actions to enhance the browsing experience.

120. The inventions taught by the ‘021 patent solve discrete, technological problems associated with computer systems and network performance. Specifically, it addresses the technical challenges of measuring web browsing Quality of Experience (QoE) at an intermediate

network node, considering the complexities of web page transactions, distributed content across servers, and dynamic URL generation. The solution provided by the '021 patent is rooted in technological innovation and contributes to the optimization of network performance and user experience.

121. The '021 patent family has been cited by 17 United States and international patents and patent applications as relevant prior art. Specifically, patents issued to the following companies and research institutions have cited the '021 patent family as relevant prior art:

- BT Group plc
- Meta Platforms, Inc.
- Cisco Systems, Inc.
- Telefonaktiebolaget Lm Ericsson
- Tencent Holdings Ltd
- Apple Inc.
- Nippon Telegraph & Telephone Corp.
- EchoStar Corporation
- Intel Corporation

COUNT I
INFRINGEMENT OF U.S. PATENT NO. 7,099,273

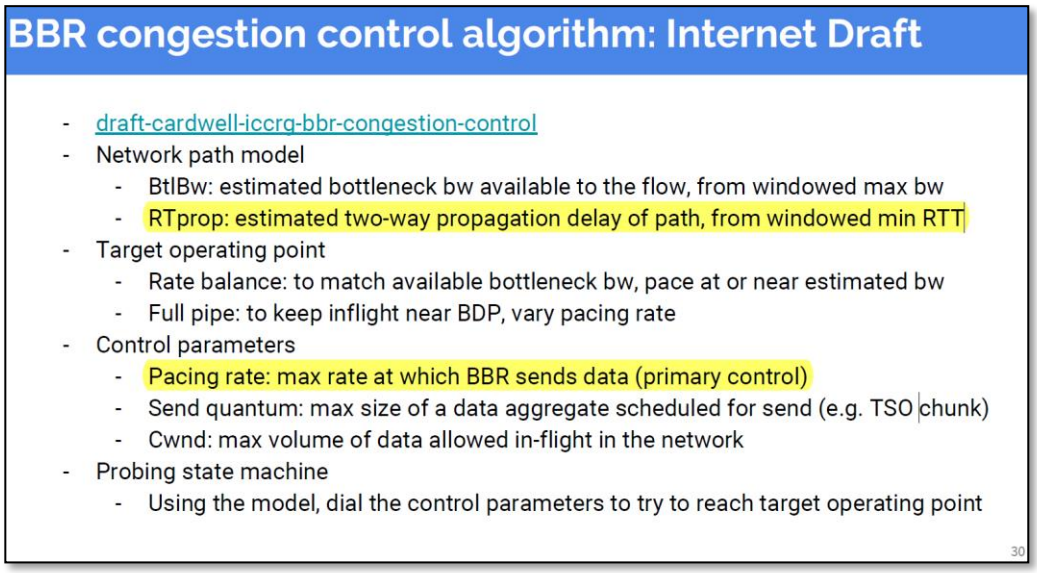
122. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

123. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising systems and methods for data transport acceleration and management within a network communication system.

124. Google designs, makes, sells, offers to sell, imports, and/or uses the following products: the Google Cloud Platform (GCP) (including Google Cloud Storage, Google Compute Engine, Google Cloud CDN, and Google Cloud Application Load Balancer); YouTube.com; and Google Meet (collectively, the "Google '273 Product(s)").

125. One or more Google subsidiaries and/or affiliates use the Google '273 Products in regular business operations.

126. One or more of the Google '273 Products include technology that performs the step of establishing a data connection between a sender and receiver using a handshake process.



Neal Cardwell, et al., *BBR Congestion Control Work at Google – IEFT 101 Update*, IETF101 PRESENTATION at 30 (March 2018) (emphasis added).

127. The Google '273 Products send a TCP packet with the SYN (Synchronize) flag set to the server. This packet contains an initial sequence number (ISN), which helps the server and client synchronize their sequence numbers. The ISN used by the Google '273 Products are represented as "x." Upon receiving the SYN packet, the Google '273 Products sends a TCP packet back with both the SYN and ACK flags set. This packet contains two pieces of information: the responsive ISN, usually represented as 'y,' and an acknowledgment number, which is the ISN plus one (x+1). The acknowledgment number is used to confirm that the sender has received the SYN packet.

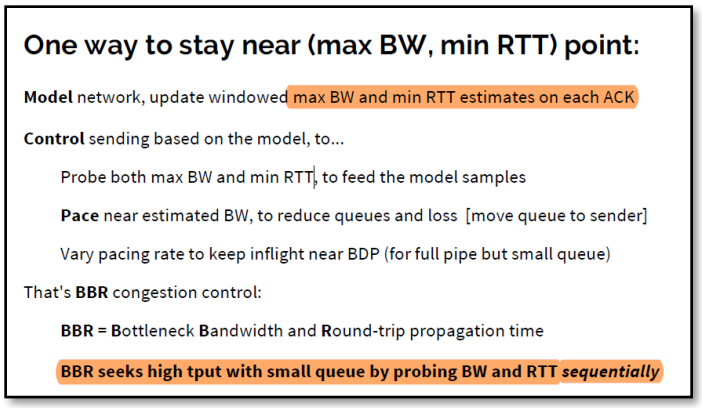
128. In establishing a connection between the sender and the receiver after receiving the SYN-ACK packet, the Google '273 Products send another packet with the ACK flag set. This packet contains an acknowledgment number, which is the ISN plus one (y+1).

129. The Google '273 Products measure round trip times (RTT) of packets sent between a client and server over a network. Specifically, the Google '273 Products measure the round-trip propagation time (RTprop) using the minimum round-trip time (RTT) for the connection by keeping track of the lowest observed RTT in the recent past. This value represents the round-trip propagation time (RTprop) of the connection.

130. The Google '273 Products perform timestamping. Specifically, when a Google '273 Product transmits a data packet, it records the current time as a timestamp. The timestamp is stored in the transmission control block (TCB), which maintains the state of the TCP connection, including RTT measurements and other relevant information.

131. The Google '273 Products perform acknowledgment processing. Specifically, the Google '273 Products send an acknowledgment (ACK) for a specific packet, the sender processes the ACK and identifies the corresponding packet in the TCB. By matching the ACK with the original packet, the Google '273 Products retrieve the original timestamp associated with that packet.

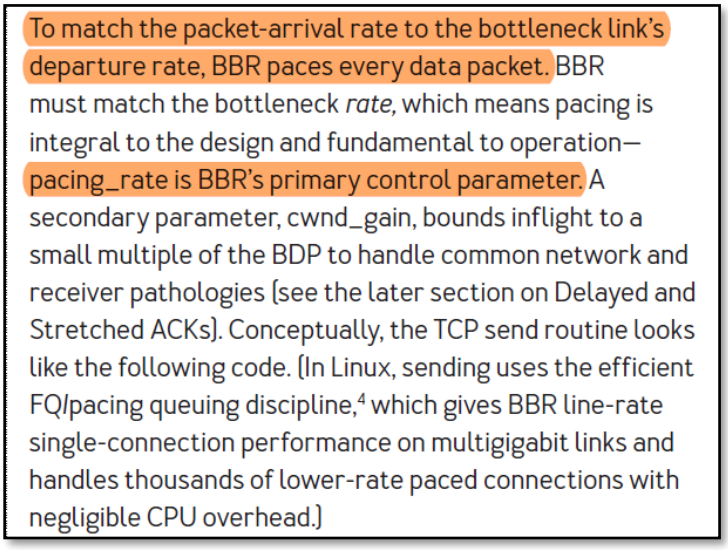
132. The Google '273 Products perform a round-trip time (RTT) calculation. Specifically, the Google '273 Products calculate the RTT for a specific packet by subtracting the original timestamp from the current time when the ACK is received. This gives an individual RTT sample for that packet as explained in the below excerpt.



Neal Cardwell, Yunchung Cheng, et al., *BBR Congestion Control*, GOOGLE IETF 97: SEOUL PRESENTATION at 9 (November 2016) (emphasis added) (describing RTT_sample = ACK_receive_time - original_timestamp).

133. The Google '273 Products perform the step of MinRTT estimation. Specifically, the Google '273 Products maintain a running estimate of the minimum RTT observed (MinRTT) over a specified time window. The MinRTT is used by the Google '273 Products to estimate the base round-trip propagation time without queuing delay. When a new RTT sample is calculated, the Google '273 Products compare it with the current MinRTT value. If the new sample is lower than the existing MinRTT, the Google '273 Products update MinRTT with a new value.

134. The Google '273 Products perform round-trip time-based pacing. Specifically, the Google '273 Products use the MinRTT estimate in performing pacing rate and congestion window calculations to ensure the sending rate is adapted based on the observed network conditions. BBR's pacing rate and congestion window calculations factor in the MinRTT value to maintain a balance between efficient data transfer and minimal congestion.



To match the packet-arrival rate to the bottleneck link's departure rate, BBR paces every data packet. BBR must match the bottleneck *rate*, which means pacing is integral to the design and fundamental to operation—pacing_rate is BBR's primary control parameter. A secondary parameter, cwnd_gain, bounds inflight to a small multiple of the BDP to handle common network and receiver pathologies (see the later section on Delayed and Stretched ACKs). Conceptually, the TCP send routine looks like the following code. (In Linux, sending uses the efficient FQ/pacing queuing discipline,[4] which gives BBR line-rate single-connection performance on multigigabit links and handles thousands of lower-rate paced connections with negligible CPU overhead.)

Neal Cardwell, Yuchung Cheng, C. Stephen Gunn, Soheil Hassas Yeganeh, Van Jacobson, *BBR: Congestion-Based Congestion Control*, ACM Queue, Sep/Oct 2016 and CACM, Feb 2017 (emphasis added).

135. The Google '273 Products calculate a congestion window parameter, which defines the maximum quantity of unacknowledged data packets permitted to be transmitted to the recipient.

136. The Google '273 Products calculate a pacing rate based on these estimates to determine how quickly it should transmit data.

137. The Google '273 Products calculate a congestion window. Specifically, the Google '273 Products calculate a cwnd value based on the estimated bottleneck bandwidth (BtlBw) and RTT to ensure the congestion window is large enough not to limit the sending rate derived from the BtlBw and RTT estimates. This is done by setting the cwnd to the product of the estimated BtlBw and RTT: cwnd = BtlBw * RTT. The calculation done by the Google '273 Products ensures that the cwnd value is large enough to accommodate the in-flight data based on the BtlBw and RTT estimates, while also accounting for potential variations in network conditions.

138. The Google ‘273 Products calculate a congestion window (cwnd) based on the bottleneck bandwidth (BtlBw) and round-trip time (RTT) estimates to ensure the sending rate is not constrained by the window size. The cwnd effectively sets a limit on the number of unacknowledged data packets in transit, but it is not set by a specific parameter for the maximum number of unacknowledged packets.

139. The Google ‘273 Products transmit additional data packets to the receiver in response a transmit timer expiration. The period of the transmit timer is based on the round-trip time measurements and the congestion window parameter.

140. Google has directly infringed and continues to directly infringe the ‘273 patent by, among other things, making, using, offering for sale, and/or selling technology for transferring data from a sender to a receiver in a communication network, including but not limited to the Google ‘273 Products.

141. The Google ‘273 Products are available to businesses and individuals throughout the United States.

142. The Google ‘273 Products are provided to businesses and individuals located in the District of Delaware.

143. By making, using, testing, offering for sale, and/or selling products and services for transferring data from a sender to a receiver in a communication network, including but not limited to the Google ‘273 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the ‘273 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

144. Google also indirectly infringes the ‘273 patent by actively inducing infringement under 35 U.S.C. § 271(b).

145. Google has had knowledge of the '273 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '273 patent and knew of its infringement, including by way of this lawsuit.

146. Alternatively, Google has had knowledge of the '273 patent since at least December 31, 2020, based on its citation of the '273 patent as relevant prior art in three patents and patent applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent Application No. 2020/0412658 (published Jan. 9, 2020)
- U.S. Patent No. 10,999,206 (granted May 4, 2021)
- U.S. Patent No. 11,509,593 (granted November 22, 2022)

147. In addition, Google has cited the '273 patent family in at least 24 patents and patent applications including the following patents and patent applications:

- U.S. Patent No. 7,023,974 (granted April 4, 2006)
- U.S. Patent No. 7,239,609 (granted July 3, 2007)
- U.S. Patent No. 7,240,136 (granted July 3, 2007)
- U.S. Patent No. 7,321,567 (granted January 22, 2008)
- U.S. Patent No. 7,454,458 (granted November 18, 2008)
- U.S. Patent No. 7,460,558 (granted December 2, 2008)
- U.S. Patent No. 7,512,706 (granted March 31, 2009)
- U.S. Patent No. 7,743,003 (granted June 22, 2010)
- U.S. Patent No. 8,019,704 (granted September 13, 2011)
- U.S. Patent No. 8,255,343 (granted August 28, 2012)
- U.S. Patent No. 8,458,327 (granted June 4, 2013)
- U.S. Patent No. 8,606,730 (granted December 10, 2013)
- U.S. Patent No. 8,868,075 (granted October 21, 2014)
- U.S. Patent No. 8,966,070 (granted February 24, 2015)
- U.S. Patent No. 9,037,660 (granted May 19, 2015)
- U.S. Patent No. 9,576,271 (granted February 21, 2017)
- U.S. Patent Application No. 2003/0099197 (published May 29, 2003)
- U.S. Patent Application No. 2004/0003029 (published January 1, 2004)
- U.S. Patent Application No. 2005/0070246 (published March 31, 2005)
- U.S. Patent Application No. 2006/0133418 (published June 22, 2006)
- U.S. Patent Application No. 2006/0136574 (published June 22, 2006)
- U.S. Patent Application No. 2006/0168217 (published July 27, 2006)
- U.S. Patent Application No. 2009/0252117 (published October 8, 2009)

- European Patent No. EP1691445 (granted January 7, 2009)

148. Google intended to induce patent infringement by third-party customers and users of the Google '273 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '273 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '273 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '273 Products that have the capability of operating in a manner that infringe one or more of the claims of the '273 patent, including at least claim 1, and Google further provides documentation and training materials that cause customers and end users of the Google '273 Products to utilize the products in a manner that directly infringe one or more claims of the '273 patent.[14] By providing instruction and training to customers and end-users on how to use the Google '273 Products in a manner that directly infringes one or more claims of the '273 patent, including at least claim 1, Google specifically intended to induce infringement of the '273 patent. Google

[14] *See e.g.*, Neal Cardwell & Yuchung Cheng*, TCP BBR Congestion Control Comes to GCP – Your Internet Just Got Faster*, GOOGLE CLOUD BLOG (July 20, 2017), https://cloud.google.com/blog/products/networking/tcp-bbr-congestion-control-comes-to-gcp-your-internet-just-got-faster; CCWG, *BBRv3 Algorithm: Bug Fixes and Public Internet Deployment*, IETF MEETING 117 (July 26, 2023) (https://datatracker.ietf.org/meeting/117/materials/slides-117-ccwg-bbrv3-algorithm-bug-fixes-and-public-internet-deployment-00 (last visited Sept. 2023); *HPCC++: Enhanced High Precision Congestion Control, ICCRG Meeting session at IETF110,* YOUTUBE.COM (March 2021), https://www.youtube.com/watch?v=Km7dzk6-4_E&t=5361s; *Google Cloud networking in depth: Cloud CDN*, GOOGLE CLOUD BLOG (June 6, 2019) https://cloud.google.com/blog/products/networking/google-cloud-networking-in-depth-cloud-cdn (last visited Sept. 2023); *How to optimize your network for live video on Google Cloud*, GOOGLE CLOUD BLOG (February 1, 2021), https://cloud.google.com/blog/products/networking/how-to-optimize-your-network-for-live-video-on-google-cloud (last visited Sept. 2023); and *Introducing Media CDN—the modern extensible platform for delivering immersive experiences,* GOOGLE CLOUD BLOG (April 25, 2022), https://cloud.google.com/blog/products/networking/introducing-media-cdn(last visited Sept. 2023).

engaged in such inducement to promote the sales of the Google '273 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '273 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '273 patent, knowing that such use constitutes infringement of the '273 patent.

149. The '273 patent is well-known within the industry as demonstrated by multiple citations to the '273 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '273 patent without paying a reasonable royalty. Google is infringing the '273 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

150. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '273 patent.

151. As a result of Google's infringement of the '273 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT II
INFRINGEMENT OF U.S. PATENT NO. 7,444,418

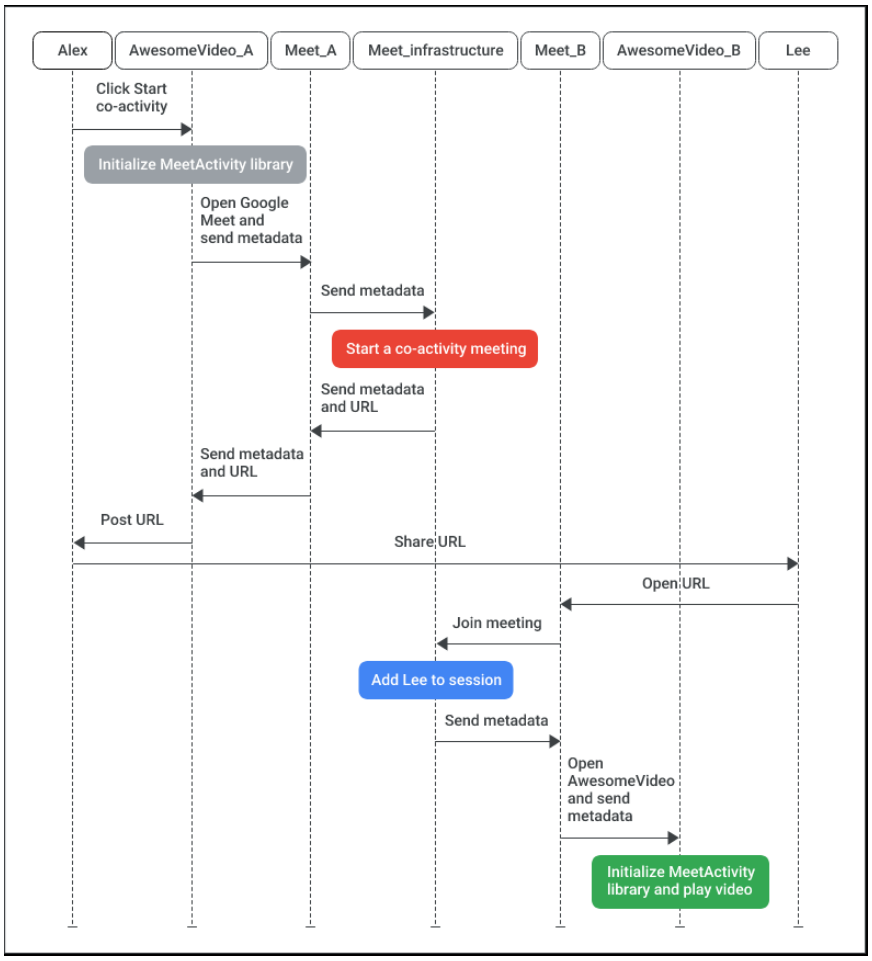
152. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

153. Google designs, makes, uses, sells, and/or offers for sale in the United States products that transcode multimedia information within a network communication system.

154. Google designs, makes, sells, offers to sell, imports, and/or uses the following products: Google Meet and YouTube.com (collectively, the "Google '418 Product(s)").

155. One or more Google subsidiaries and/or affiliates use the Google '418 Products in regular business operations.

156. The Google '418 Products intercept digital multimedia information transmitted between a sender and a recipient, where the data is encoded at the sender using a primary transmission rate.

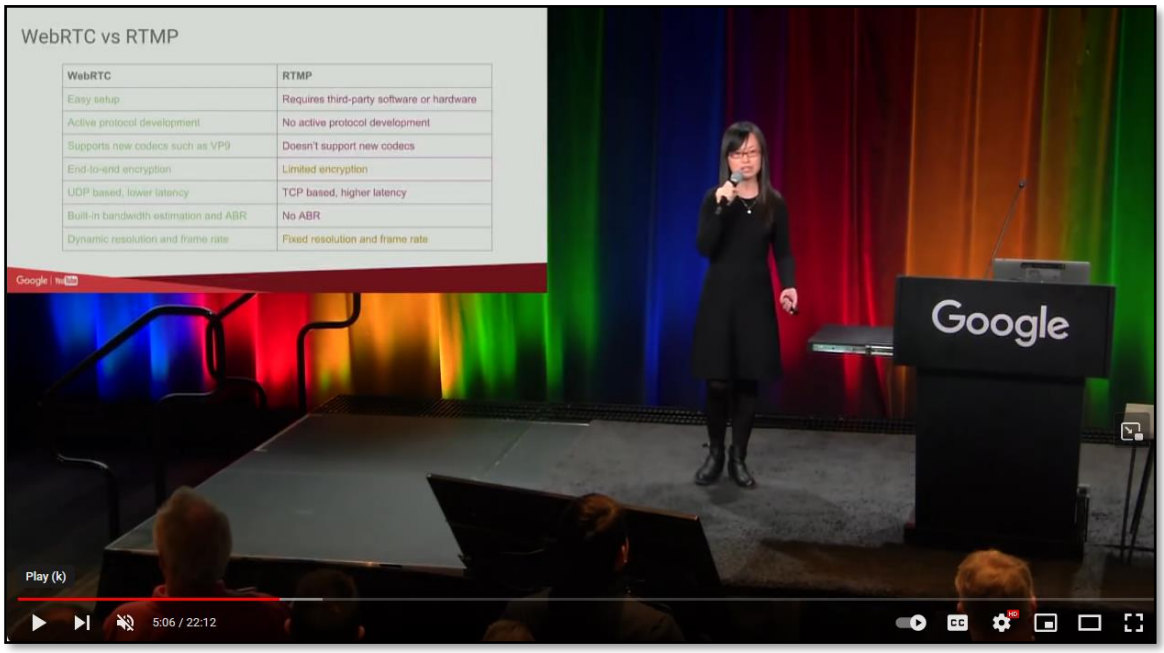


Google Meet End-user Concepts, GOOGLE WORKSPACE DOCUMENTATION, available at: https://developers.google.com/meet/live-sharing/guides/concepts (last visited September 2023).

157. The Google '418 Products contain functionality that performs the step of intercepting digital multimedia information communicated between a transmitter and a receiver,

with the digital multimedia information encoded at the transmitter at a first transmission rate. Specifically, the multimedia information is captured by the Google '418 Products as it is encoded at the transmitter side at a specific first transmission rate. This rate denotes the speed at which the data is being sent and is related to the compression methods used to make the data suitable for transmission.

158. The Google '418 Products calculate the accessible transmission rate for a connection on the recipient end, in which the estimation process involves determining the round-trip time for data packets exchanged between the service module and the recipient through the secondary communication channel.



WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0 ("Another big advantage of WebRTC is that is has built-in-bandwidth estimation adaptive bitrate, this is very use for mobile live streaming . . so WebRTC does dynamic resolution changing.").

159. The Google '418 Products contain functionality for estimating an available transmission rate of a receiver-side connection. This step is critical for dynamically adapting the

multimedia stream to match the capabilities of the receiving end and the conditions of the network. The estimation process performed by the Google '418 Products involves measuring the trip time of data packets communicated between the service module and the receiver via the second channel. By accurately gauging the available bandwidth, the Google '418 Products can dynamically adapt to the multimedia stream.

160. The Google '418 Products contain functionality wherein if the initial transmission rate exceeds the transmission rate, the digital multimedia information is transcoded to adapt it to the available transmission rate, ensuring compatibility.

161. The Google '418 Products contain functionality that, if the first transmission rate is greater than the available transmission rate, transcodes the digital multimedia information to conform the digital multimedia information to the available transmission rate. Specifically, the Google '418 Products determine if there is a need for transcoding by comparing the first transmission rate (original encoding rate) with the estimated available transmission rate.

162. If the Google '418 Products determine there is a need for transcoding, the Google '418 Products convert the media data from one format and/or bitrate to another. Specifically, the Google '418 Products alter the bit rate of the media data to match the estimated available transmission rate.

163. The Google '418 Products contain functionality for performing conditional transcoding based on real-time network conditions.

164. The Google '418 Products convey transcoded multimedia data to the recipient via the receiver-end connection, utilizing a transmission rate derived from the estimated accessible transmission rate.

165. The Google ‘418 Products transmit transcoded multimedia information to the receiver over the receiver-side connection at a transmission rate determined from the estimated available transmission rate.

166. The Google ‘418 Products enable packaging multimedia information into suitable data packets for transmission.

167. The Google ‘418 Products transmit encoded data packets over a network to the receiver via transmission protocols.

168. Google has directly infringed and continues to directly infringe the ‘418 patent by, among other things, making, using, offering for sale, and/or selling technology that transcode multimedia information within a network communication system, including but not limited to the Google ‘418 Products.

169. The Google ‘418 Products are available to businesses and individuals throughout the United States.

170. The Google ‘418 Products are provided to businesses and individuals located in this District.

171. By making, using, testing, offering for sale, and/or selling products and services that transcode multimedia information within a network communication system, including but not limited to the Google ‘418 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the ‘418 patent, including at least claim 23 pursuant to 35 U.S.C. § 271(a).

172. Google also indirectly infringes the ‘418 patent by actively inducing infringement under 35 U.S.C. § 271(b).

173. Google has had knowledge of the '418 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '418 patent and knew of its infringement, including by way of this lawsuit.

174. Alternatively, Google has had knowledge of the '418 patent since at least May 13, 2014, when U.S. Patent No. 8,725,799, which is owned by Google and cites the '418 patent as relevant prior art, was granted.

175. Google intended to induce patent infringement by third-party customers and users of the Google '418 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '418 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '418 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '418 Products that have the capability of operating in a manner that infringe one or more of the claims of the '418 patent, including at least claim 23, and Google further provides documentation and training materials that cause customers and end users of the Google '418 Products to utilize the products in a manner that directly infringe one or more claims of the '418 patent.[15] By

[15] *See e.g., Get started with Meet for Google Workspace*, Google Workspace Learning Center, available at: https://support.google.com/a/users/answer/12836132 (last visited September 2023); *Google Meet Help*, Google Support Website, available at: https://support.google.com/meet/ (last visited September 2023); *Google Meet ToolKit – Workingly Remotely*, GOOGLE CLOUD DOCUMENTATION (May 2020); *Google Workspace Admin Help – Google Meet*, GOOGLE SUPPORT DOCUMENTATION, available at: https://support.google.com/a/topic/7302923 (last visited September 2023); *Tech Talk - Get to know Google Meet Video Conferencing*, GOOGLE CLOUD FORUM YOUTUBE CHANNEL (April 29, 2020), available at: https://www.youtube.com/watch?v=swgl395LiVk; *Background Features in Google Meet, Powered by Web ML*, GOOGLE RESEARCH BLOG (October 30, 2020), available at: https://blog.research.google/2020/10/background-features-in-google-meet.html?m=0; *Enabling Remote Working with Hangouts Meet and Hangouts Chat: A Quick Deployment Guide*, GOOGLE CLOUD DOCUMENTATION (2020); *WebRTC Update April 2014*, CHROME FOR DEVELOPERS

providing instruction and training to customers and end-users on how to use the Google '418 Products in a manner that directly infringes one or more claims of the '418 patent, including at least claim 23, Google specifically intended to induce infringement of the '418 patent. Google engaged in such inducement to promote the sales of the Google '418 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '418 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '418 patent, knowing that such use constitutes infringement of the '418 patent.

176. The '418 patent is well-known within the industry as demonstrated by multiple citations to the '418 patent in published patents and patent applications assigned to technology

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YOUTUBE CHANNEL (April 10, 2014), available at: https://www.youtube.com/watch?v=DvzDzIXoncg&t=309s; *WebRTC Update 2017*, SFHTML5 YOUTUBE CHANNEL (October 28, 2017); available at: https://www.youtube.com/watch?v=PEXnbTyygi4; *WebRTC annual update 2022*, KRANKY GEEK YOUTUBE CHANNEL (December 13, 2022), available at: https://www.youtube.com/watch?v=WEUb-G4oSAg; Niklas Blum, Serge Lachapelle & Harald Alvestrand, *WebRTC: Real-Time Communication for the Open Web Platform*, 64 COMM. ACM 50 (2021); *YouTube Live Streaming API*, YOUTUBE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/youtube/v3/live/ {last visited September 2023); *Live Stream on YouTube Guide*, YouTube HELP DOCUMENTATION, available at: https://support.google.com/youtube/topic/9257891 (last visited September 2023); *Create a YouTube live stream with an encoder*, YOUTUBE HELP DOCUMENTATION, available at: https://support.google.com/youtube/answer/2907883 (last visited September 2023); *Delivering Live YouTube Content via DASH*, GOOGLE DEVELOPERS DOCUMENTATION (November 4, 2022), available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash; *Google I/O 2013 - Find the Next Big Thing with the YouTube Analytics API*, Google for Developer YouTube Channel (May 18, 2013); *From gQUIC to IETF QUIC and Beyond by Ian Swett*, MILE-HIGH VIDEO CONFERENCE PRESENTATION (November 30, 2020), available at: https://www.mile-high.video/past-event-mhv-23; *Adaptive Streaming for You and YouTube*, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s; *WebRTC based Live streaming in YouTube (YouTube)*, WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0; *ML Algorithms for Trust and Safety @ YouTube*, @SCALE YOUTUBE CHANNEL (June 16, 2023), available at: https://www.youtube.com/watch?v=zpoazJbi23U; and *Polymer @ YouTube (Polymer Summit 2017)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (August 22, 2017), available at: https://www.youtube.com/watch?v=tNulrEbTQf8.

companies and academic institutions. Google is utilizing the technology claimed in the '418 patent without paying a reasonable royalty. Google is infringing the '418 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

177. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '418 patent.

178. As a result of Google's infringement of the '418 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT III
INFRINGEMENT OF U.S. PATENT NO. 7,031,314

179. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

180. Google designs, makes, uses, sells, and/or offers for sale in the United States products for providing differentiated services within a network communication system.

181. Google designs, makes, sells, offers to sell, imports, and/or use the Google Cloud Platform which includes the Google Application Load Balancer, Google Proxy Network Load Balancer, and Google Passthrough Network Load Balancer (collectively, the "Google '314 Product(s)").

182. One or more Google subsidiaries and/or affiliates use the Google '314 Products in regular business operations.

183. The Google '314 Products comprise a processing unit.

184. The Google '314 Products comprise a storage component, functionally connected to the processor, responsible for retaining data and instructions that, upon execution by the processor, direct the processor's operations.

185. The memory unit in the Google '314 Products stores data related to connections, service applications, and other system elements. In addition, the Google '314 Products store in memory instructions that guide the processor in classifying connections, forming connections, and redirecting data.

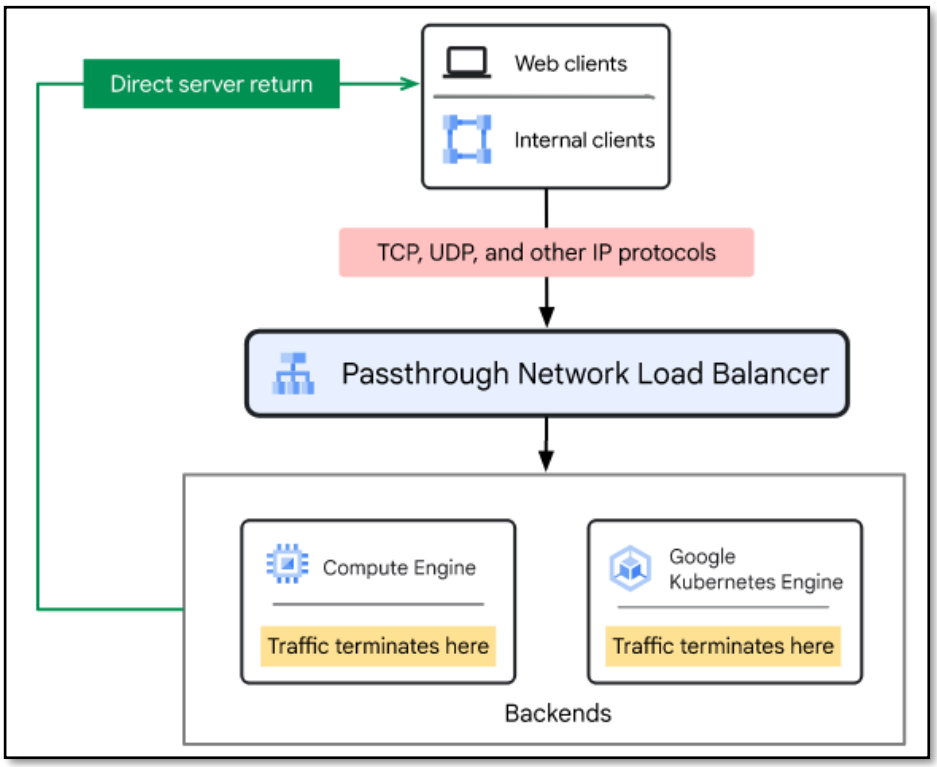
186. The Google '314 Products contain functionality for requesting a connection between the client and server to ascertain if it aligns with predefined service criteria, where the predetermined service criteria are linked to at least one of the multiple service applications.

187. The Google '314 Products perform differentiated services within a network communication system. Specifically, the Google '314 Products contain functionality for classifying a connection that has been requested between the client and the server to determine whether the connection matches predetermined service criteria. When a connection is requested, various attributes of the request are analyzed by the Google '314 Products. These attributes could include the source, destination, requested service type, priority, or other data associated with the connection.

188. The Google '314 Products compare attributes associated with a connection against predetermined service criteria. Specifically, the predetermined service criteria can include a set of rules or conditions associated with various service applications.

189. The Google '314 Products contain functionality for establishing an initial connection between the client and the service module, and a subsequent connection between the

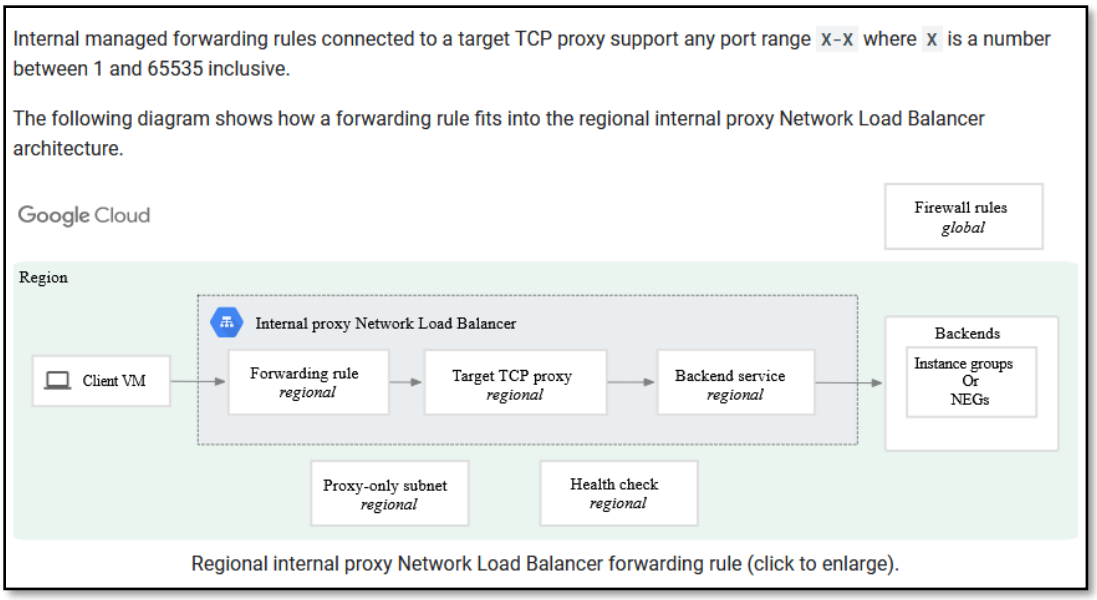
service module and the server when the connection aligns with the predefined service requirements.



Google Cloud Load Balancing Overview, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/load-balancing/docs/load-balancing-overview (showing the architecture of the Passthrough Network Load Balancer).

190. The Google '314 Products include functionality that enables forming two connections: a first connection between the client and the service module, and a second connection between the service module and a server. The forming of a first and second connection is done by the Google '314 Products in response to a connection matching the predetermined service criteria.

191. The Google '314 Products orchestrate the formation of a connection between the client and the service module, following the protocols and parameters that relate to the classified service criteria.

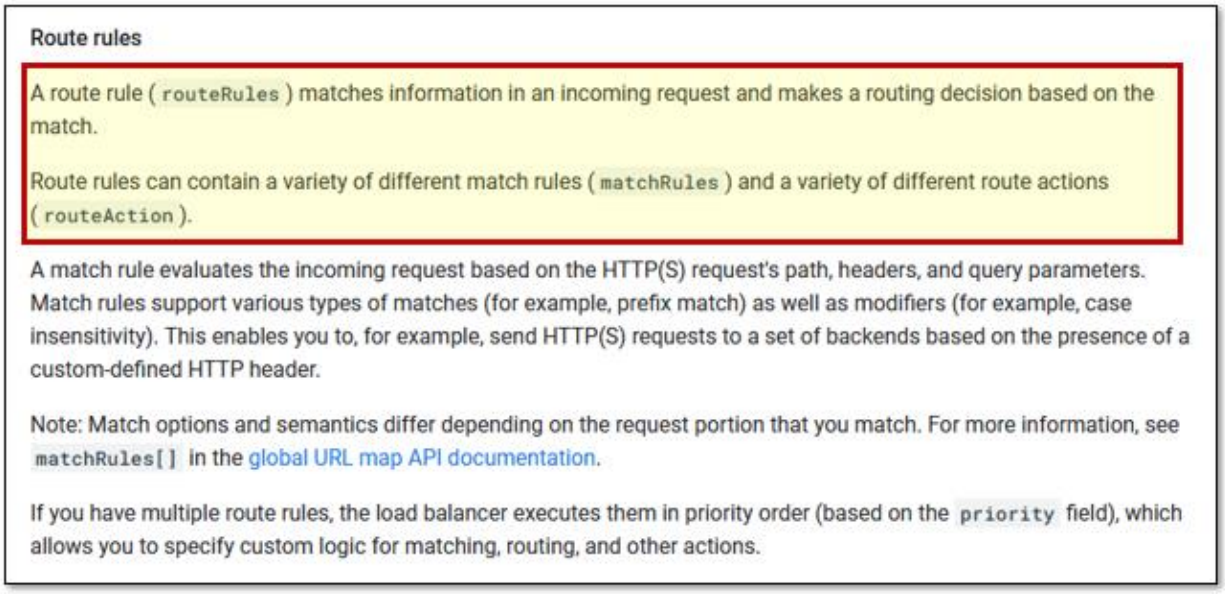


Forwarding Rules – Google Cloud Load Balancing, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/load-balancing/docs/forwarding-rule-concepts (last visited September 2023).

192. The Google '314 Products establish a connection between the service module and a server.

193. The Google '314 Products comprise functionality that utilizes the initial and secondary connections to redirect a portion or more of the data communication between the client and a server towards the service application related to the pre-established service parameters.

194. The Google '314 Products comprise a service module that manages the flow of data between the client and the server, directing a portion or all of the data to specific service applications based on the matched criteria.



Route rules

A route rule (`routeRules`) matches information in an incoming request and makes a routing decision based on the match.

Route rules can contain a variety of different match rules (`matchRules`) and a variety of different route actions (`routeAction`).

A match rule evaluates the incoming request based on the HTTP(S) request's path, headers, and query parameters. Match rules support various types of matches (for example, prefix match) as well as modifiers (for example, case insensitivity). This enables you to, for example, send HTTP(S) requests to a set of backends based on the presence of a custom-defined HTTP header.

Note: Match options and semantics differ depending on the request portion that you match. For more information, see `matchRules[]` in the global URL map API documentation.

If you have multiple route rules, the load balancer executes them in priority order (based on the `priority` field), which allows you to specify custom logic for matching, routing, and other actions.

Traffic management overview for global external Application Load Balancers, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/load-balancing/docs/https/traffic-management-global (last visited September 2023) (emphasis added).

195. Google has directly infringed and continues to directly infringe the '314 patent by, among other things, making, using, offering for sale, and/or selling technology comprising a system for performing differentiated services within a network communication system, including but not limited to the Google '314 Products.

196. The Google '314 Products are available to businesses and individuals throughout the United States.

197. The Google '314 Products are provided to businesses and individuals located in this District.

198. By making, using, testing, offering for sale, and/or selling products and services comprising a system for performing differentiated services within a network communication system, including but not limited to the Google '314 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '314 patent, including at least claim 27 pursuant to 35 U.S.C. § 271(a).

199. Google also indirectly infringes the '314 patent by actively inducing infringement under 35 U.S.C. § 271(b).

200. Google has had knowledge of the '314 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '314 patent and knew of its infringement, including by way of this lawsuit.

201. Alternatively, Google has had knowledge of the '314 patent since at least June 22, 2020, based on its citation of the '314 patent as relevant prior art in four patents and patent applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent No. 7,743,003 (granted June 22, 2010)
- U.S. Patent No. 8,019,704 (granted September 13, 2011)
- U.S. Patent No. 8,255,343 (granted August 28, 2012)
- U.S. Patent No. 8,606,730 (granted December 10, 2013)

202. In addition, Google has cited the '314 patent family in at least 23 patents and patent applications including the following patents and patent applications:

- U.S. Patent No. 7,023,974 (granted April 4, 2006)
- U.S. Patent No. 7,239,609 (granted July 3, 2007)
- U.S. Patent No. 7,240,136 (granted July 3, 2007)
- U.S. Patent No. 7,321,567 (granted January 22, 2008)
- U.S. Patent No. 7,454,458 (granted November 18, 2008)
- U.S. Patent No. 7,460,558 (granted December 2, 2008)
- U.S. Patent No. 7,512,706 (granted March 31, 2009)
- U.S. Patent No. 8,458,327 (granted June 4, 2013)
- U.S. Patent No. 8,868,075 (granted October 21, 2014)
- U.S. Patent No. 8,966,070 (granted February 24, 2015)
- U.S. Patent No. 9,037,660 (granted May 19, 2015)
- U.S. Patent No. 9,576,271 (granted February 21, 2017)
- U.S. Patent No. 10,999,206 (granted May 4, 2021)
- U.S. Patent No. 11,509,593 (granted November 22, 2022)
- U.S. Patent Application No. 2020/0412658 (published Jan. 9, 2020)
- U.S. Patent Application No. 2003/0099197 (published May 29, 2003)
- U.S. Patent Application No. 2004/0003029 (published January 1, 2004)
- U.S. Patent Application No. 2005/0070246 (published March 31, 2005)

- U.S. Patent Application No. 2006/0133418 (published June 22, 2006)
- U.S. Patent Application No. 2006/0136574 (published June 22, 2006)
- U.S. Patent Application No. 2006/0168217 (published July 27, 2006)
- U.S. Patent Application No. 2009/0252117 (published October 8, 2009)
- European Patent No. EP1691445 (granted January 7, 2009)

203. Google intended to induce patent infringement by third-party customers and users of the Google '314 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '314 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '314 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '314 Products that have the capability of operating in a manner that infringe one or more of the claims of the '314 patent, including at least claim 27, and Google further provides documentation and training materials that cause customers and end users of the Google '314 Products to utilize the products in a manner that directly infringe one or more claims of the '314 patent.[16] By

[16] *See e.g., Consideration for NGFW Appliances*, GOOGLE CLOUD WHITEPAPER (September 10, 2022); *Internal Load Balancing in 5 Minutes,* GOOGLE CLOUD PLATFORM PRESENTATION, available at: https://cloud.google.com/files/internal-load-balancing-tutorial-slides.pdf (last visited September 2023); *Cloud OnAir: Networking 104 - Everything You Need to Know About Load Balancers on GCP,* GOOGLE CLOUD TECH YOUTUBE CHANNEL (August 6, 2019); available at: https://www.youtube.com/watch?v=D4XZkCJyqis; *Next generation load balancing capabilities – Cloud Next '21,* GOOGLE CLOUD TECH YOUTUBE CHANNEL (November 5, 2021), available at: https://www.youtube.com/watch?v=x6TAXS3sjWM; *Google Cloud Security White Papers Packet*, GOOGLE CLOUD DOCUMENTATION (March 2018) (including the following white papers: Google Cloud Infrastructure Security Design Overview, Encryption at Rest in Google Cloud; Encryption in Transit in Google Cloud; Application Layer Transport Security in Google Cloud); *Cloud Load Balancing Deep Dive and Best Practices (Cloud Next '19),* GOOGLE CLOUD TECH YOUTUBE CHANNEL (August 10, 2019), available at: https://www.youtube.com/watch?v=HUHBq_VGgFg; *System and Organization Controls (SOC) 3 Report on the Google Cloud Platform System Relevant to Security, Availability, and Confidentiality*, GOOGLE CLOUD DOCUMENTATION (June 25, 2019); and *Cloud Load Balancing Deep Dive and Best Practices (Cloud Next '18)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (July 25, 2018), available at: https://www.youtube.com/watch?v=J5HJ1y6PeyE.

providing instruction and training to customers and end-users on how to use the Google '314 Products in a manner that directly infringes one or more claims of the '314 patent, including at least claim 27, Google specifically intended to induce infringement of the '314 patent. Google engaged in such inducement to promote the sales of the Google '314 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '314 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '314 patent, knowing that such use constitutes infringement of the '314 patent.

204. The '314 patent is well-known within the industry as demonstrated by multiple citations to the '314 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '314 patent without paying a reasonable royalty. Google is infringing the '314 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

205. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '314 patent.

206. As a result of Google's infringement of the '314 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT IV
INFRINGEMENT OF U.S. PATENT NO. 7,586,871

207. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

208. Google designs, makes, uses, sells, and/or offers for sale in the United States products that process data communications passing through a node between a first data network and a second data network.

209. Google designs, makes, sells, offers to sell, imports, and/or uses the Google Cloud Firewall, Internal passthrough Network Load Balancer, and External Network Load Balancer (collectively, the "Google '871 Product(s)").

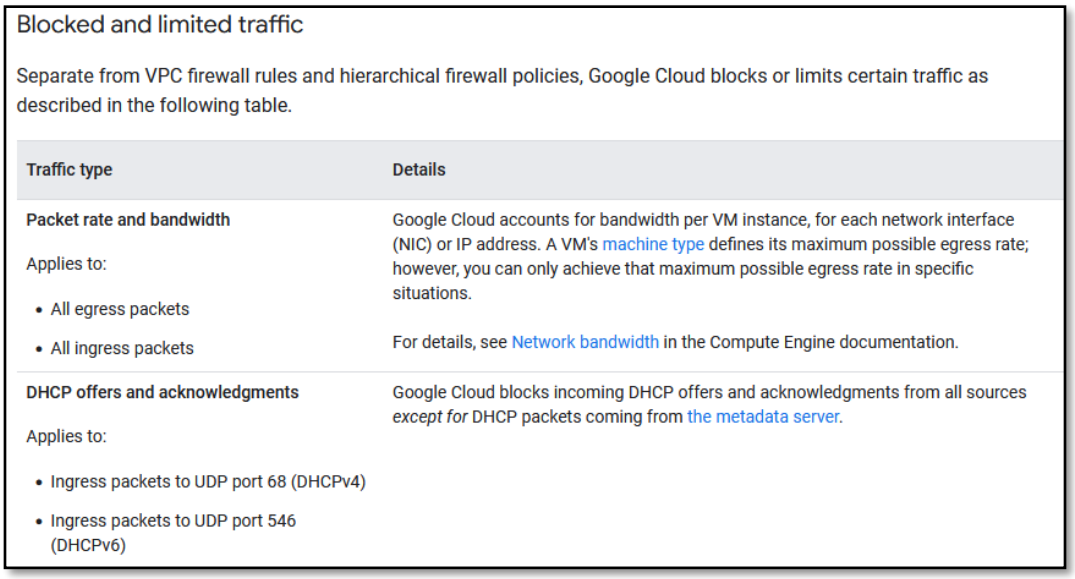
210. One or more Google subsidiaries and/or affiliates use the Google '871 Products in regular business operations.

211. The Google '871 Products detect an event associated with a data communication arriving at the node from a first data network.

212. The Google '871 Products monitor incoming data packets at the node from a first data network.

213. The Google '871 Products determine whether the data communication is to be suspended for service at the node based on the detected event. Specifically, once an event associated with the data communication is detected by the Google '871 Products, the system evaluates the nature and severity of the event. The decision to suspend or allow the communication is based on rules and policies configured by the Google '871 Products.

214. The Google '871 Products determine (based on a detected event) whether the data communication should be suspended at the node.



Blocked and limited traffic

Separate from VPC firewall rules and hierarchical firewall policies, Google Cloud blocks or limits certain traffic as described in the following table.

Traffic type	Details
Packet rate and bandwidth Applies to: • All egress packets • All ingress packets	Google Cloud accounts for bandwidth per VM instance, for each network interface (NIC) or IP address. A VM's machine type defines its maximum possible egress rate; however, you can only achieve that maximum possible egress rate in specific situations. For details, see Network bandwidth in the Compute Engine documentation.
DHCP offers and acknowledgments Applies to: • Ingress packets to UDP port 68 (DHCPv4) • Ingress packets to UDP port 546 (DHCPv6)	Google Cloud blocks incoming DHCP offers and acknowledgments from all sources *except for* DHCP packets coming from the metadata server.

VPC Firewall Rules, GOOGLE CLOUD FIREWALL DOCUMENTATION, available at: https://cloud.google.com/firewall/docs/firewalls (last visited September 2023).

215. The Google '871 Products process one or more suspended data communications using information in the suspended data communication. Specifically, the Google '871 Products isolate the suspended data communication for (at least in part) the purpose of processing the suspended data communication. Based on the analysis and processing, the Google '871 Products determine how to handle the suspended data communication.

Firewall policy rule `--tls-inspect` flag

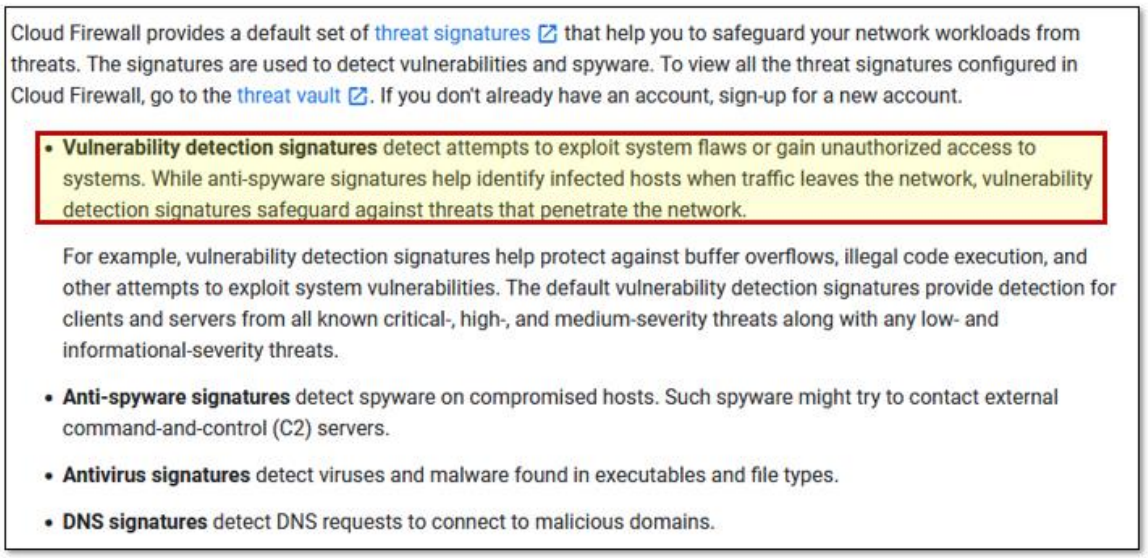
To enable decryption of the traffic matching the configured firewall policy rules, use the `--tls-inspect` flag. When you configure the `--tls-inspect` flag in the firewall policy rule, Cloud Firewall generates a new server certificate for matched TLS traffic. Intermediate CAs within Cloud Firewall sign this certificate. These intermediate CAs are, in turn, signed by CA pools within CA Service. This certificate is then presented to the client, and a TLS connection is established. The generated certificate is cached for a short time for subsequent connections to the same host.

TLS Inspection Overview, GOOGLE CLOUD FIREWALL DOCUMENTATION, available at: https://cloud.google.com/firewall/docs/about-tls-inspection (last visited September 2023) (emphasis added).

216. The Google '871 Products detect a return data communication arriving at the node from the second data network in response to the processed data communication from the first data

network. Further, the Google '871 Products allow the detected return data communication to pass through the node without processing.

217. The Google '871 Products monitor the incoming data communication from the second data network. If the detected return data communication is associated with prior processed data communication from the first network the Google '871 Products determine that the return data communication does not need further processing at the node.



Cloud Firewall provides a default set of threat signatures that help you to safeguard your network workloads from threats. The signatures are used to detect vulnerabilities and spyware. To view all the threat signatures configured in Cloud Firewall, go to the threat vault. If you don't already have an account, sign-up for a new account.

- **Vulnerability detection signatures** detect attempts to exploit system flaws or gain unauthorized access to systems. While anti-spyware signatures help identify infected hosts when traffic leaves the network, vulnerability detection signatures safeguard against threats that penetrate the network.

  For example, vulnerability detection signatures help protect against buffer overflows, illegal code execution, and other attempts to exploit system vulnerabilities. The default vulnerability detection signatures provide detection for clients and servers from all known critical-, high-, and medium-severity threats along with any low- and informational-severity threats.

- **Anti-spyware signatures** detect spyware on compromised hosts. Such spyware might try to contact external command-and-control (C2) servers.
- **Antivirus signatures** detect viruses and malware found in executables and file types.
- **DNS signatures** detect DNS requests to connect to malicious domains.

Threat Signatures Overview, GOOGLE CLOUD FIREWALL DOCUMENTATION, available at: https://cloud.google.com/firewall/docs/about-threats (last visited September 2023) (emphasis added).

218. The Google '871 Products process a suspended data communication based on information in the data communication.

219. Google has directly infringed and continues to directly infringe the '871 patent by, among other things, making, using, offering for sale, and/or selling technology that process data communications passing through a node between a first data network and a second data network, including but not limited to the Google '871 Products.

220. The Google '871 Products are available to businesses and individuals throughout the United States.

221. The Google '871 Products are provided to businesses and individuals located in this District.

222. By making, using, testing, offering for sale, and/or selling products and services that process data communications passing through a node between a first data network and a second data network, including but not limited to the Google '871 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '871 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

223. Google also indirectly infringes the '871 patent by actively inducing infringement under 35 U.S.C. § 271(b).

224. Google has had knowledge of the '871 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '871 patent and knew of its infringement, including by way of this lawsuit.

225. Alternatively, Google has had knowledge of the '871 patent since at least September 17, 2013, when U.S. Patent No. 8,538,979, which is owned by Google and cites the '871 patent application as relevant prior art, was granted.

226. Google intended to induce patent infringement by third-party customers and users of the Google '871 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '871 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '871 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '871 Products that have the capability of operating in a manner that infringe one or more of the

claims of the '871 patent, including at least claim 1, and Google further provides documentation and training materials that cause customers and end users of the Google '871 Products to utilize the products in a manner that directly infringe one or more claims of the '871 patent.[17] By providing instruction and training to customers and end-users on how to use the Google '871 Products in a manner that directly infringes one or more claims of the '871 patent, including at least claim 1, Google specifically intended to induce infringement of the '871 patent. Google engaged in such inducement to promote the sales of the Google '871 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '871 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '871 patent, knowing that such use constitutes infringement of the '871 patent.

227. The '871 patent is well-known within the industry as demonstrated by multiple citations to the '871 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '871 patent without paying a reasonable royalty. Google is infringing the '871 patent in a manner best

[17] *See e.g., Google Cloud Security Foundations Guide*, GOOGLE CLOUD WHITEPAPER (December 2022); *Cloud Firewall Overview*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/firewall/docs/about-firewalls (last visited September 2023); *Google Cloud Platform, GCP Network and Security Telemetry (Cloud Next '18)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (April 10, 2018), available at https://www.youtube.com/watch?v=as9mXNEcaDo (last visited September 2023); *Google Cloud, REST Resource: Firewalls, Compute Engine Documentation*, GOOGLE CLOUD COMPUTE REFERENCE DOCUMENTS, available at https://cloud.google.com/compute/docs/reference/rest/v1/firewalls (last visited September 2023); and *Google Cloud - How can I detect network-based threats in my GCP environment?*, GOOGLE CLOUD TECH YOUTUBE CHANNEL, available at: https://www.youtube.com/watch?v=IClLmDLAzH0 (last visited September 2023).

described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

228. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '871 patent.

229. As a result of Google's infringement of the '871 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT V
INFRINGEMENT OF U.S. PATENT NO. 7,616,559

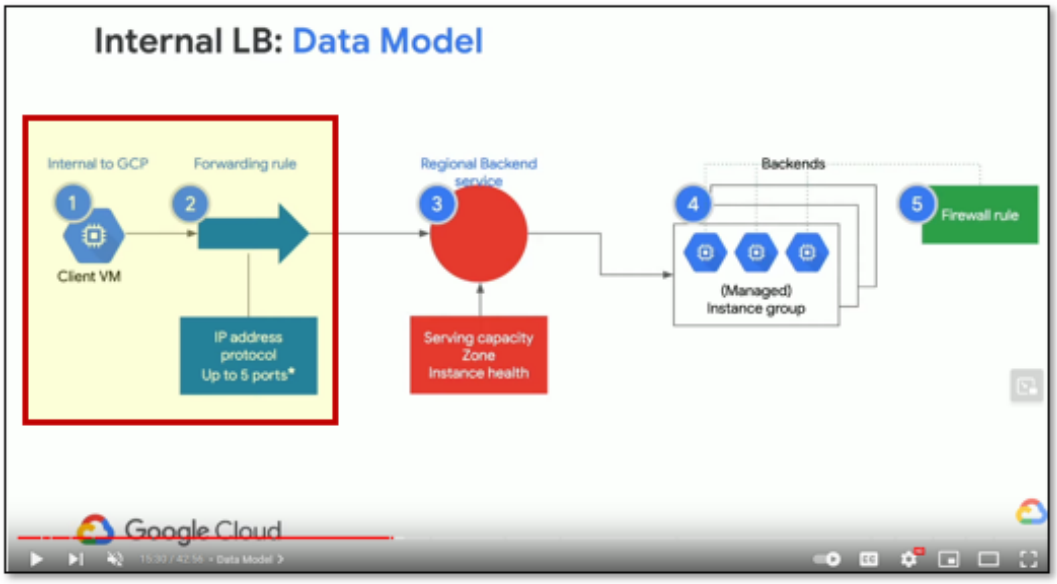
230. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

231. Google designs, makes, uses, sells, and/or offers for sale in the United States products that communicate information over multiple communications links.

232. Google designs, makes, sells, offers to sell, imports, and/or uses the Google Cloud Platform, which includes the Google Application Load Balancer, Google Proxy Network Load Balancer, and Google Passthrough Network Load Balancer (collectively, the "Google '559 Product(s)").

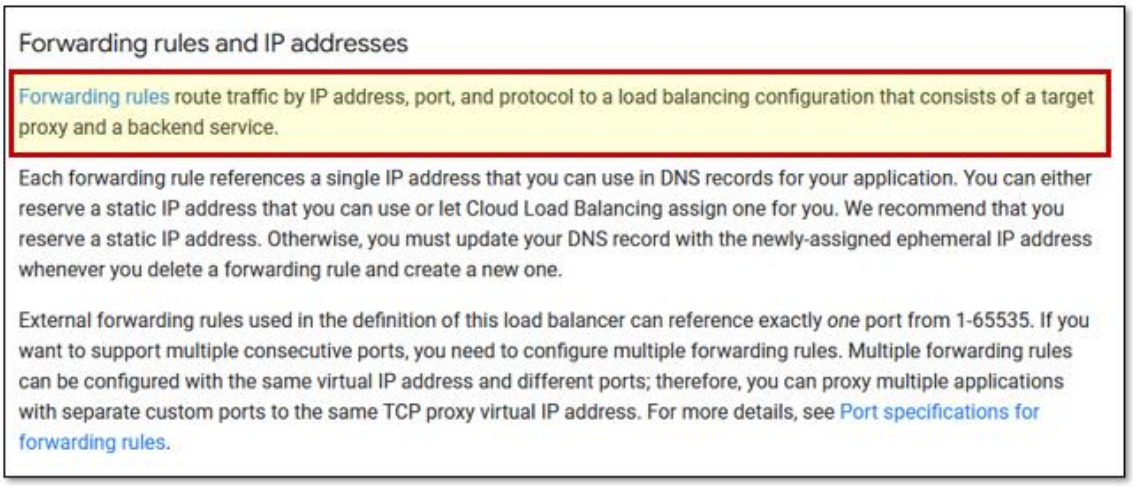
233. One or more Google subsidiaries and/or affiliates use the Google '559 Products in regular business operations.

234. The Google '559 Products identify an initial communication path with a specific security protocol for the transmission of data between a client system and a server system.



Cloud OnAir: Networking 104 - Everything You Need to Know About Load Balancers on GCP, GOOGLE CLOUD TECH YOUTUBE CHANNEL (August 6, 2019), available at: https://www.youtube.com/watch?v=D4XZkCJyqis (annotation showing that security protocol of the data transmission is identified by the Google '559 Products).

235. The Google '559 Products detect a first communications link having a first security feature for communicating data between a client device and a server device. The Google '559 Products utilize algorithms to ensure the first security level's parameters, such as encryption and authentication protocols are met. By identifying the presence of this first communications link, the Google '559 Products can prioritize a communications link for use based on predefined security requirements or other criteria.



Forwarding rules and IP addresses

Forwarding rules route traffic by IP address, port, and protocol to a load balancing configuration that consists of a target proxy and a backend service.

Each forwarding rule references a single IP address that you can use in DNS records for your application. You can either reserve a static IP address that you can use or let Cloud Load Balancing assign one for you. We recommend that you reserve a static IP address. Otherwise, you must update your DNS record with the newly-assigned ephemeral IP address whenever you delete a forwarding rule and create a new one.

External forwarding rules used in the definition of this load balancer can reference exactly *one* port from 1-65535. If you want to support multiple consecutive ports, you need to configure multiple forwarding rules. Multiple forwarding rules can be configured with the same virtual IP address and different ports; therefore, you can proxy multiple applications with separate custom ports to the same TCP proxy virtual IP address. For more details, see Port specifications for forwarding rules.

External proxy Network Load Balancer overview, GOOGLE CLOUD LOAD BALANCING DOCUMENTATION, available at: https://cloud.google.com/load-balancing/docs/tcp (last visited September 2023) (emphasis added).

236. The Google '559 Products contain functionality for identifying an alternate communication pathway that possesses a different level of security for exchanging data between a client and a server.

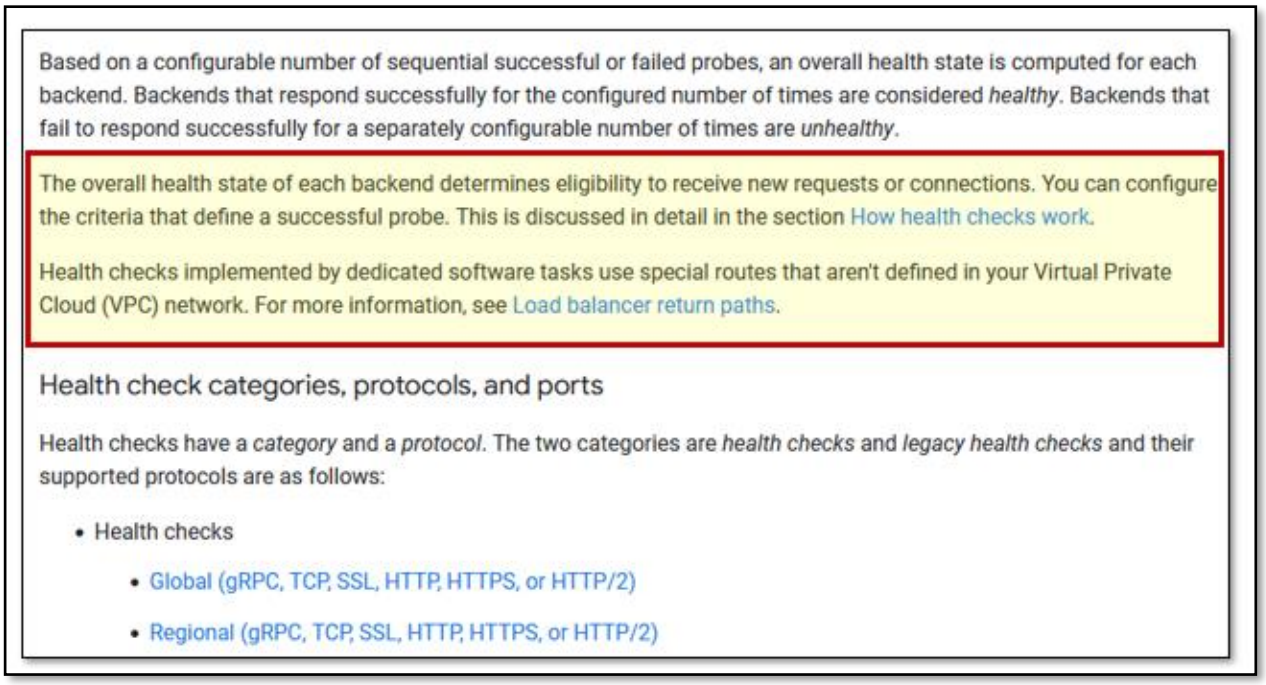
237. The Google '559 Products detect a second communications link having a second security feature. The second communications link enables data to be sent between a client and server. Further, the Google '559 Products monitor network channels and enable security protocols to evaluate the parameters of the second communications link. The security features used by the Google '559 Products include encryption standards and/or authentication technology. The second communications link serves to ensure continuous data transfer by the Google '559 Products if the first communications link is unavailable.

238. The Google '559 Products determine if the initial communication path is inaccessible, opting for the alternate communication pathway with its distinct security level, to facilitate data transmission between a client and server.

239. The Google '559 Products select the first communications link, having first security, for communicating between a client device and a server. After the detection of both the

first and second communications links, the Google '559 Products prioritize the link with the higher security features (e.g., first link) for data transmission. This prioritization by the Google '559 Products is based on pre-established security criteria and network conditions. If the first link meets the requirements, it is selected by the Google '559 Products to provide enhanced security and reliability.

240. The Google '559 Products maintain a connection with one of either the initial or alternate communication pathways, to ensure uninterrupted data exchange between the client system and the server system.



Based on a configurable number of sequential successful or failed probes, an overall health state is computed for each backend. Backends that respond successfully for the configured number of times are considered *healthy*. Backends that fail to respond successfully for a separately configurable number of times are *unhealthy*.

The overall health state of each backend determines eligibility to receive new requests or connections. You can configure the criteria that define a successful probe. This is discussed in detail in the section How health checks work.

Health checks implemented by dedicated software tasks use special routes that aren't defined in your Virtual Private Cloud (VPC) network. For more information, see Load balancer return paths.

Health check categories, protocols, and ports

Health checks have a *category* and a *protocol*. The two categories are *health checks* and *legacy health checks* and their supported protocols are as follows:

- Health checks
  - Global (gRPC, TCP, SSL, HTTP, HTTPS, or HTTP/2)
  - Regional (gRPC, TCP, SSL, HTTP, HTTPS, or HTTP/2)

Health Checks Overview, GOOGLE CLOUD LOAD BALANCING DOCUMENTATION, available at: https://cloud.google.com/load-balancing/docs/health-check-concepts (last visited September 2023) (emphasis added).

241. If the first communications link is not available, the Google '559 Products select the second communications link having second security, for communicating between the client device and the server device. This action is prompted when the preferred first link, typically with higher security, is unavailable or fails to meet a criteria. The Google '559 Products switch to the

second link, ensuring continuous communication. While generally considered less secure, the second link serves as a contingency, allowing uninterrupted information flow between a client and server.

242. If the data transmission is interrupted over the alternate communication pathway, the Google '559 Products contain functionality for restoring the connection to the initial communication link to continue exchanging information between the client and the server.

243. The Google '559 Products enable linking to one of either the first communications link and the second communications link, to maintain communicative connectivity during communications between the client and server. The Google '559 Products establish a dynamic link management process, maintaining an active connection by continuously evaluating both communication links.

244. The Google '559 Products contain functionality where if communication disruption occurs over the primary communication link, the alternate communication link is reestablished to facilitate the exchange of information between the client and server.

245. The Google '559 Products enable reconnecting to the first communications link for communicating information between the client and server if communications are hindered over the second communications link. This step is a part of a resilient communication strategy that actively monitors both links and switches back to the first link when issues are detected with the second communications link.

246. The Google '559 Products enable reconnecting to the second communications link for communicating information between the client device and the server device, if communications are hindered over the first communications link. If issues are detected on the primary link, the

Google '559 Products automatically switch to the secondary link, maintaining the communication while also adhering to the security protocols.

247. Google has directly infringed and continues to directly infringe the '559 patent by, among other things, making, using, offering for sale, and/or selling technology comprising a method of communicating information over multiple communications links, including but not limited to the Google '559 Products.

248. The Google '559 Products are available to businesses and individuals throughout the United States.

249. The Google '559 Products are provided to businesses and individuals located in this District.

250. By making, using, testing, offering for sale, and/or selling products and services comprising a method of communicating information over multiple communications links, including but not limited to the Google '559 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '559 patent, including at least claim 5 pursuant to 35 U.S.C. § 271(a).

251. Google also indirectly infringes the '559 patent by actively inducing infringement under 35 U.S.C. § 271(b).

252. Google has had knowledge of the '559 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '559 patent and knew of its infringement, including by way of this lawsuit.

253. Alternatively, Google has had knowledge of the '559 patent since at least January 28, 2014, based on its citation of the '559 patent as relevant prior art in three patents and patent

applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent No. 9,326,132 (granted April 26, 2016)
- U.S. Patent No. 8,897,753 (granted November 25, 2014)
- U.S. Patent No. 8,640,174 (granted January 28, 2014)

254. Google intended to induce patent infringement by third-party customers and users of the Google '559 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '559 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '559 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '559 Products that have the capability of operating in a manner that infringe one or more of the claims of the '559 patent, including at least claim 5, and Google further provides documentation and training materials that cause customers and end users of the Google '559 Products to utilize the products in a manner that directly infringe one or more claims of the '559 patent.[18] By

[18] *See e.g., Consideration for NGFW Appliances*, GOOGLE CLOUD WHITEPAPER (September 10, 2022); *Internal Load Balancing in 5 Minutes*, GOOGLE CLOUD PLATFORM PRESENTATION, available at: https://cloud.google.com/files/internal-load-balancing-tutorial-slides.pdf (last visited September 2023); *Cloud OnAir: Networking 104 - Everything You Need to Know About Load Balancers on GCP*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (August 6, 2019); available at: https://www.youtube.com/watch?v=D4XZkCJyqis; *Next generation load balancing capabilities – Cloud Next '21,* GOOGLE CLOUD TECH YOUTUBE CHANNEL (November 5, 2021), available at: https://www.youtube.com/watch?v=x6TAXS3sjWM; *Google Cloud Security White Papers Packet*, GOOGLE CLOUD DOCUMENTATION (March 2018) (including the following white papers: Google Cloud Infrastructure Security Design Overview, Encryption at Rest in Google Cloud; Encryption in Transit in Google Cloud; Application Layer Transport Security in Google Cloud); *Cloud Load Balancing Deep Dive and Best Practices (Cloud Next '19)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (August 10, 2019), available at: https://www.youtube.com/watch?v=HUHBq_VGgFg; *System and Organization Controls (SOC) 3 Report on the Google Cloud Platform System Relevant to Security, Availability, and Confidentiality*, GOOGLE CLOUD DOCUMENTATION (June 25, 2019); and *Cloud Load Balancing*

providing instruction and training to customers and end-users on how to use the Google '559 Products in a manner that directly infringes one or more claims of the '559 patent, including at least claim 5, Google specifically intended to induce infringement of the '559 patent. Google engaged in such inducement to promote the sales of the Google '559 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '559 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '559 patent, knowing that such use constitutes infringement of the '559 patent.

255. The '559 patent is well-known within the industry as demonstrated by multiple citations to the '559 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '559 patent without paying a reasonable royalty. Google is infringing the '559 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

256. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '559 patent.

257. As a result of Google's infringement of the '559 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

Deep Dive and Best Practices (Cloud Next '18), GOOGLE CLOUD TECH YOUTUBE CHANNEL (July 25, 2018), available at: https://www.youtube.com/watch?v=J5HJ1y6PeyE.

COUNT VI
INFRINGEMENT OF U.S. PATENT NO. 9,275,167

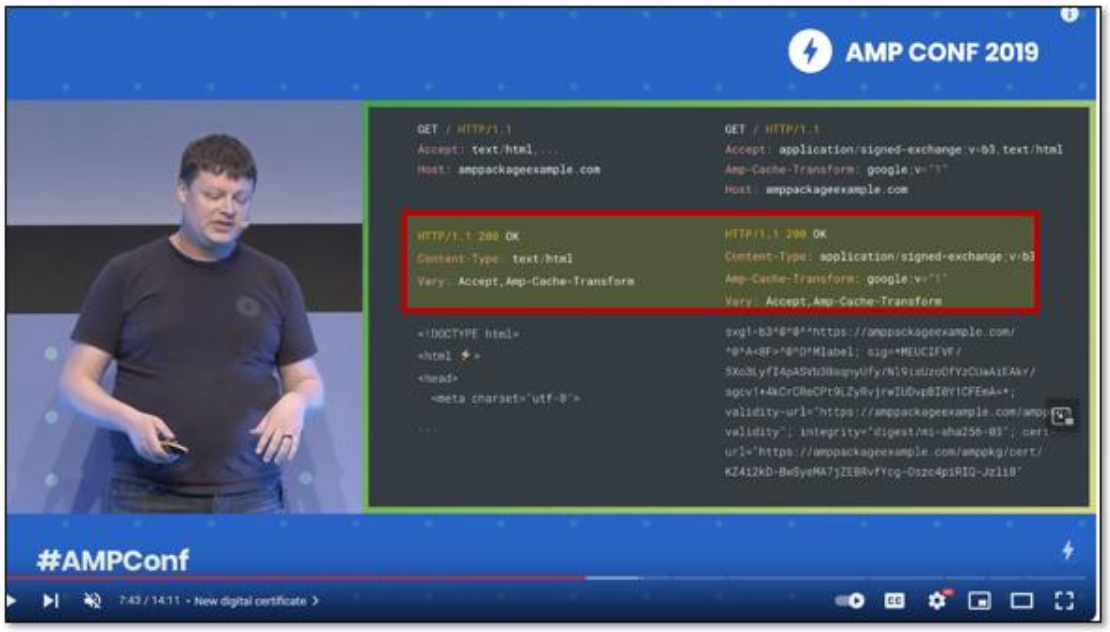
258. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

259. Google designs, makes, uses, sells, and/or offers for sale in the United States products for rendering a webpage.

260. Google designs, makes, sells, offers to sell, imports, and/or uses Google Accelerated Mobile Pages including Google AMP Cache (collectively, the "Google '167 Product(s)").

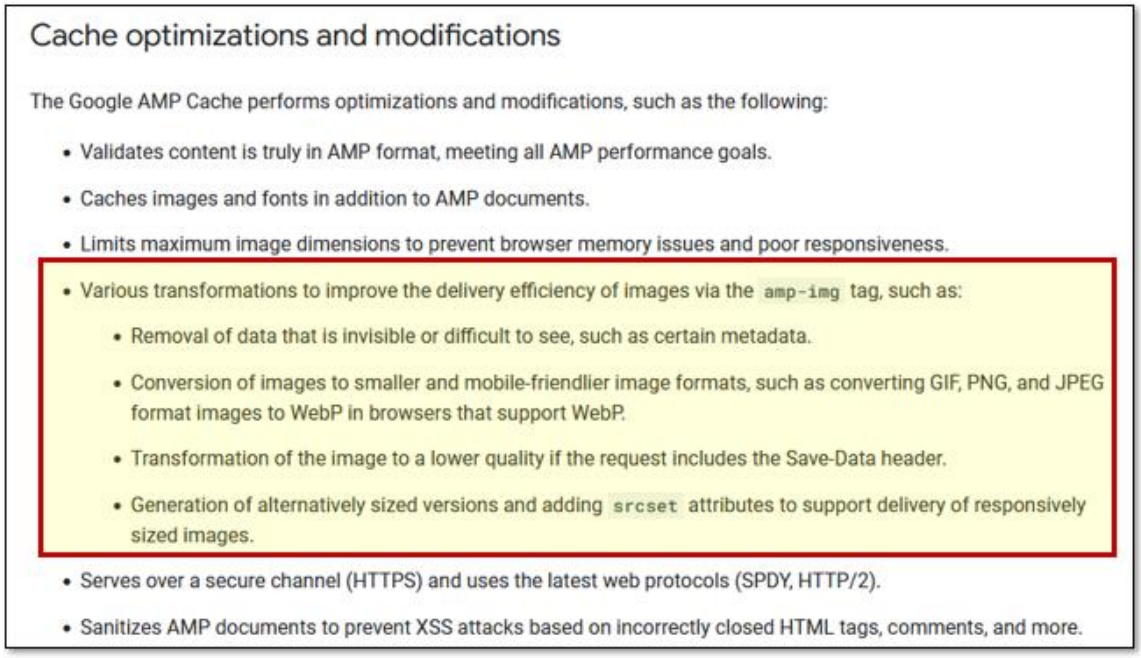
261. One or more Google subsidiaries and/or affiliates use the Google '167 Products in regular business operations.

262. The Google '167 Products identify content sections during a traversal of a first Document Object Model (DOM) representing a webpage. Specifically, this is performed by the Google '167 Products by parsing the webpage's HTML and constructing a tree-like representation of its elements.



Signed exchanges for better AMP URLs and easier analytics (AMP Conf '19), THE AMP YOUTUBE CHANNEL (April 18, 2019), available at: https://www.youtube.com/watch?v=KrjBYzPUGnw (emphasis added) (discussing optimization of AMP pages by the Google AMP Cache).

263. Further, the Google '167 Products perform a systematic visitation of the nodes in the DOM tree to identify particular content sections, such as headers, paragraphs, images, or other elements.



Cache optimizations and modifications

The Google AMP Cache performs optimizations and modifications, such as the following:

- Validates content is truly in AMP format, meeting all AMP performance goals.
- Caches images and fonts in addition to AMP documents.
- Limits maximum image dimensions to prevent browser memory issues and poor responsiveness.
- Various transformations to improve the delivery efficiency of images via the `amp-img` tag, such as:
  - Removal of data that is invisible or difficult to see, such as certain metadata.
  - Conversion of images to smaller and mobile-friendlier image formats, such as converting GIF, PNG, and JPEG format images to WebP in browsers that support WebP.
  - Transformation of the image to a lower quality if the request includes the Save-Data header.
  - Generation of alternatively sized versions and adding `srcset` attributes to support delivery of responsively sized images.
- Serves over a secure channel (HTTPS) and uses the latest web protocols (SPDY, HTTP/2).
- Sanitizes AMP documents to prevent XSS attacks based on incorrectly closed HTML tags, comments, and more.

Google AMP Cache Guide, *AMP ON GOOGLE WEBSITE*, available at: https://developers.google.com/amp/cache/overview (last visited September 2023) (emphasis added).

264. The Google '167 Products transform the initial Document Object Model (DOM) to a subsequent DOM, guided by an adaptation criterion detailing characteristics of a mobile device. The transformation of the DOM by the Google '167 Products involves identifying and maintaining nodes associated with a tab box in the revised DOM.

265. The Google '167 Products transform the first DOM to a second DOM based on an adaptation parameter that describes features of a mobile device. This transformation by the Google '167 Products involves analyzing the content and structure of the first DOM and applying specific rules or algorithms to modify the DOM according to the given adaptation parameters.

266. The Google '167 Products serialize the second DOM by transforming it into modified source code using markup language and then preparing the second DOM for further processing and adaptation.

267. The Google ‘167 Products serialize the second DOM by converting the second DOM into adapted markup language source code. The serialization by the Google ‘167 Products refers to the process of translating the tree-like structure of the second DOM, which may be in a program-specific format, into a standardized markup language, such as HTML or XML.

268. The Google ‘167 Products use the transformed markup language source code to generate an adapted version of the original webpage. This newly created webpage (generated by Google ‘167 Products) is designed for compatibility with characteristics of a mobile device.

269. The Google ‘167 Products construct an adapted webpage from the markup language source code. Specifically, the previously serialized markup language source code containing the necessary adaptations for a mobile device, is interpreted and converted into a renderable format by the Google ‘167 Products.

270. The resulting adapted webpage is made available by the Google ‘167 Products for downloading by a mobile device.

271. Google has directly infringed and continues to directly infringe the ‘167 patent by, among other things, making, using, offering for sale, and/or selling technology for rendering a webpage, including but not limited to the Google ‘167 Products.

272. The Google ‘167 Products are available to businesses and individuals throughout the United States.

273. The Google ‘167 Products are provided to businesses and individuals located in this District.

274. By making, using, testing, offering for sale, and/or selling products and services comprising a method of rendering a webpage, including but not limited to the Google ‘167

Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '167 patent, including at least claim 14 pursuant to 35 U.S.C. § 271(a).

275. Google also indirectly infringes the '167 patent by actively inducing infringement under 35 U.S.C. § 271(b).

276. Google has had knowledge of the '167 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '167 patent and knew of its infringement, including by way of this lawsuit.

277. Alternatively, Google has had knowledge of the '167 patent since at least the date the '167 patent was granted (March 1, 2016). Prior to the granting of the '167 patent, Google had cited the '167 patent application as relevant prior art in its own patents and patent applications including U.S. Patent No. 9,053,177 which was granted on June 9, 2015 and was assigned to and owned by Google.

278. In addition, Google has cited the '167 patent family in at least 7 additional patents and patent applications including the following patents and patent applications:

- U.S. Patent No. 9,323,731 (granted April 26, 2016)
- U.S. Patent No. 9,665,617 (granted May 30, 2017)
- U.S. Patent No. 9,967,316 (granted May 8, 2018)
- U.S. Patent No. 10,943,055 (granted March 9, 2021)
- U.S. Patent Application No. 2014/0108589 (published April 17, 2014)
- U.S. Patent Application No. 2015/0161281 (published June 11, 2015)
- WIPO PCT Application No. WO2016186882A1 (published November 24, 2016)

279. Google intended to induce patent infringement by third-party customers and users of the Google '167 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '167 patent. Google performed the acts that constitute induced infringement,

and would induce actual infringement, with knowledge of the '167 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '167 Products that have the capability of operating in a manner that infringe one or more of the claims of the '167 patent, including at least claim 14, and Google further provides documentation and training materials that cause customers and end users of the Google '167 Products to utilize the products in a manner that directly infringe one or more claims of the '167 patent.[19] By providing instruction and training to customers and end-users on how to use the Google '167 Products in a manner that directly infringes one or more claims of the '167 patent, including at least claim 14, Google specifically intended to induce infringement of the '167 patent. Google engaged in such inducement to promote the sales of the Google '167 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '167 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '167 patent, knowing that such use constitutes infringement of the '167 patent.

280. The '167 patent is well-known within the industry as demonstrated by multiple citations to the '167 patent in published patents and patent applications assigned to technology

[19] *See e.g.*, *Google AMP Cache Overview Guide*, GOOGLE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/amp/cache/overview (last visited September 2023); *Building the perfect AMP Viewer, with Google Search (AMP Conf '17)*, AMP YOUTUBE CHANNEL (March 28, 2017), available at: https://www.youtube.com/watch?v=hyd84z_qX8Q; *What's in an AMP URL?*, GOOGLE FOR DEVELOPERS BLOG (February 5, 2017), available at: https://developers.googleblog.com/2017/02/whats-in-amp-url.html; *How AMP Achieves Its Speed – Google I/O 2016 Conference Presentation*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (May 23, 2016), available at: https://www.youtube.com/watch?v=cfekj564rs0&t=212s; *About Accelerated Mobile Pages (AMP)*, GOOGLE ADS HELP DOCUMENTATION, available at: https://support.google.com/google-ads/answer/7496737 (last visited September 2023); and *The AMP Keynote (Google I/O '17)*, THE AMP YOUTUBE AMP CHANNEL (May 17, 2017), available at: https://www.youtube.com/watch?v=BGyF5Uh3w1M.

companies and academic institutions. Google is utilizing the technology claimed in the '167 patent without paying a reasonable royalty. Google is infringing the '167 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

281. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '167 patent.

282. As a result of Google's infringement of the '167 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT VII
INFRINGEMENT OF U.S. PATENT NO. 9,191,664

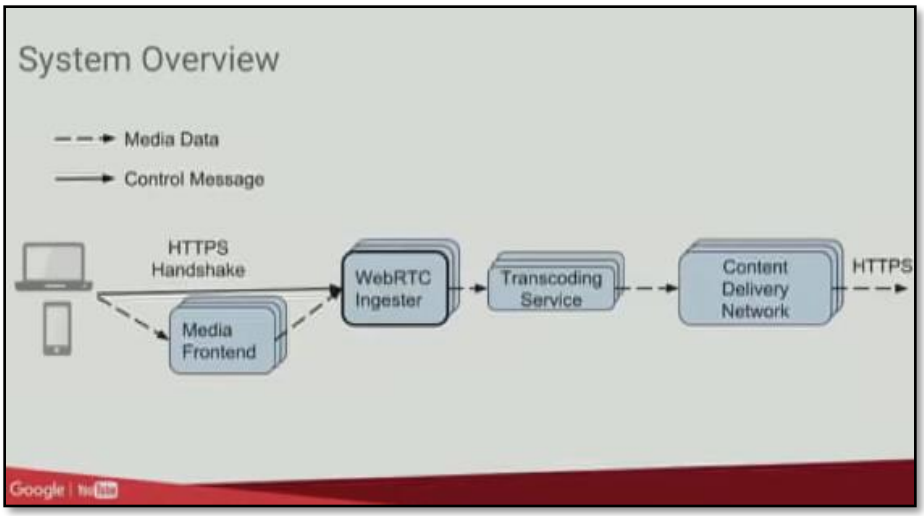
283. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

284. Google designs, makes, uses, sells, and/or offers for sale in the United States products for adaptive bitrate management.

285. Google designs, makes, sells, offers to sell, imports, and/or uses the following products: YouTube and Google Meet (collectively, the "Google '664 Product(s)").

286. One or more Google subsidiaries and/or affiliates use the Google '664 Products in regular business operations.

287. The Google '664 Products accept and/or gather media data, which comprises both elements of audio and video information.

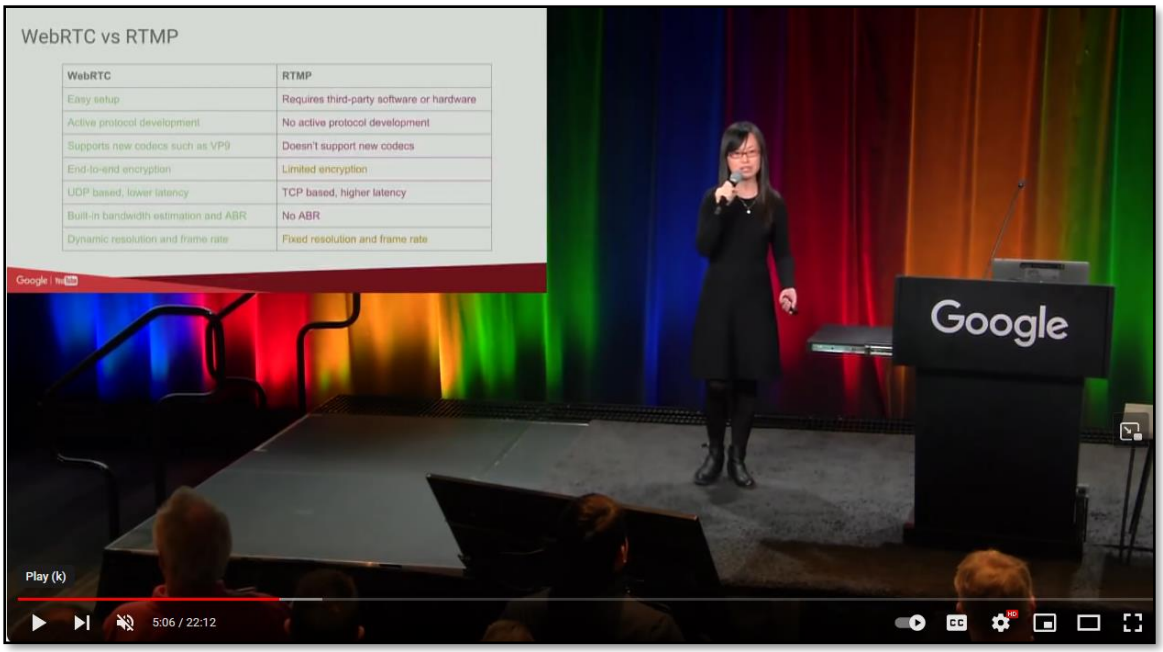


WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0

288. The Google '664 Products perform the step of receiving media data that includes both audio media data and video media data. In this stage of the method, the computer system ingests or collects media data, which might come from various sources like a live broadcast, stored files, or a streaming service. The data is then parsed or separated into audio and video components for further processing,

GOOGLE MEET PROTOCOL CAPTURE USING WIRESHARK (emphasis added) (note that the Google Meet server response identifies the use of "useadaptivelayering" for the VP9 video codec).

289. The Google '664 Products take in an ideal session bitrate, which is the preferred data transfer rate for the media session.



WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0 ("Another big advantage of WebRTC is that is has built-in-bandwidth estimation adaptive bitrate, this is very use for mobile live streaming . . so WebRTC does dynamic resolution changing.").

290. The Google '664 Products perform the step of receiving an optimal session bitrate. This step entails obtaining a pre-calculated or pre-defined bitrate that is considered optimal for the media session. This optimal bitrate is a crucial parameter that affects the quality and efficiency of both audio and video transmission.

291. The Google '664 Products distribute the received ideal session bitrate between the audio and video media data, resulting in an optimal audio bitrate and an optimal video bitrate.

292. The Google '664 Products perform the step of allocating the optimal session bitrate between the audio media data and the video media data to produce an optimal audio bitrate and an optimal video bitrate. In this process, the total available optimal session bitrate is divided into two portions, aligning with the requirements for audio and video quality.

GOOGLE MEET PROTOCOL CAPTURE USING WIRESHARK (emphasis added) (note that the Google Meet server response contains RRTR messages to estimate the Round Trip Time and optimize the session bitrate).

293. The Google '664 Products transform the audio media data using the determined optimal audio bitrate through a process of encoding.

294. The Google '664 Products perform the step of encoding the audio media data using the optimal audio bitrate. This process involves compressing the raw audio data according to a specific encoding algorithm while adhering to the predetermined optimal audio bitrate.

295. The Google '664 Products transmit the video media data with the use of the optimal video bitrate through encoding.

296. The Google '664 Products perform the step of encoding the video media data using the optimal video bitrate. Similar to audio encoding, this step involves compressing raw video data into a specific format using the allocated optimal video bitrate.

297. The Google '664 Products make the encoded audio media data and the encoded video media data available for dispatch to a terminal.

298. The Google '664 Products perform the step of providing the encoded audio media data and the encoded video media data for transmittal to a terminal. This final step involves packaging the encoded audio and video data into a suitable transmission format and sending it to the receiving terminal, such as a user's device or a downstream processing system. The process may involve using specific transmission protocols and considering network conditions, latency requirements, and compatibility with the receiving device.

299. Google has directly infringed and continues to directly infringe the '664 patent by, among other things, making, using, offering for sale, and/or selling technology comprising a method of adaptive bitrate management, including but not limited to the Google '664 Products.

300. The Google '664 Products are available to businesses and individuals throughout the United States.

301. The Google '664 Products are provided to businesses and individuals located in this District.

302. By making, using, testing, offering for sale, and/or selling products and services comprising a method of adaptive bitrate management, including but not limited to the Google '664 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '664 patent, including at least claim 9 pursuant to 35 U.S.C. § 271(a).

303. Google also indirectly infringes the '664 patent by actively inducing infringement under 35 U.S.C. § 271(b).

304. Google has had knowledge of the '664 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '664 patent and knew of its infringement, including by way of this lawsuit.

305. Alternatively, Google has had knowledge of the '664 patent since at least the granting of the '664 patent on November 17, 2015, based on the '664 patent family being cited by 9 patents and patent applications that are assigned to and owned by Google prior to November 17, 2015. In addition, Google has cited the '664 patent family in at least 19 patents and patent applications including the following patents and patent applications.

- U.S. Patent No. 8,495,237 (granted July 23, 2013)
- U.S. Patent No. 9,042,261 (granted May 26, 2015)
- U.S. Patent No. 9,106,787 (granted August 11, 2015)
- U.S. Patent No. 9,166,864 (granted October 20, 2015)
- U.S. Patent No. 9,172,740 (granted October 27, 2015)
- U.S. Patent No. 9,185,429 (granted November 10, 2015)
- U.S. Patent No. 9,210,420 (granted December 8, 2015)
- U.S. Patent No. 9,225,979 (granted December 29, 2015)
- U.S. Patent No. 9,311,692 (granted April 12, 2016)
- U.S. Patent No. 9,537,920 (granted January 3, 2017)
- U.S. Patent No. 9,560,392 (granted January 31, 2017)
- U.S. Patent No. 9,654,528 (granted May 16, 2017)
- U.S. Patent No. 9,948,708 (granted April 17, 2018)
- U.S. Patent No. 10,205,984 (granted February 12, 2019)
- U.S. Patent No. 10,659,832 (granted May 19, 2020)
- U.S. Patent No. 10,728,302 (granted July 28, 2020)
- U.S. Patent Application No.2010/0306373 (published December 2, 2010)
- U.S. Patent Application No.2013/0311670 (published November 21, 2013)
- U.S. Patent Application No.2014/0074988 (published March 13, 2014)

306. Google intended to induce patent infringement by third-party customers and users of the Google '664 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '664 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '664 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '664 Products that have the capability of operating in a manner that infringe one or more of the

claims of the '664 patent, including at least claim 9, and Google further provides documentation and training materials that cause customers and end users of the Google '664 Products to utilize the products in a manner that directly infringe one or more claims of the '664 patent.[20] By providing instruction and training to customers and end-users on how to use the Google '664 Products in a manner that directly infringes one or more claims of the '664 patent, including at

[20] *See e.g., Get started with Meet for Google Workspace*, Google Workspace Learning Center, available at: https://support.google.com/a/users/answer/12836132 (last visited September 2023); *Google Meet Help*, Google Support Website, available at: https://support.google.com/meet/ (last visited September 2023); *Google Meet ToolKit – Workingly Remotely*, GOOGLE CLOUD DOCUMENTATION (May 2020); *Google Workspace Admin Help – Google Meet*, GOOGLE SUPPORT DOCUMENTATION, available at: https://support.google.com/a/topic/7302923 (last visited September 2023); *Tech Talk - Get to know Google Meet Video Conferencing*, GOOGLE CLOUD FORUM YOUTUBE CHANNEL (April 29, 2020), available at: https://www.youtube.com/watch?v=swgl395LiVk; *Background Features in Google Meet, Powered by Web ML*, GOOGLE RESEARCH BLOG (October 30, 2020), available at: https://blog.research.google/2020/10/background-features-in-google-meet.html?m=0; *Enabling Remote Working with Hangouts Meet and Hangouts Chat: A Quick Deployment Guide*, GOOGLE CLOUD DOCUMENTATION (2020); *WebRTC Update April 2014*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (April 10, 2014), available at: https://www.youtube.com/watch?v=DvzDzIXoncg&t=309s; *WebRTC Update 2017*, SFHTML5 YOUTUBE CHANNEL (October 28, 2017); available at: https://www.youtube.com/watch?v=PEXnbTyygi4; *WebRTC annual update 2022*, KRANKY GEEK YOUTUBE CHANNEL (December 13, 2022), available at: https://www.youtube.com/watch?v=WEUb-G4oSAg; Niklas Blum, Serge Lachapelle & Harald Alvestrand, *WebRTC: Real-Time Communication for the Open Web Platform*, 64 COMM. ACM 50 (2021); *YouTube Live Streaming API*, YOUTUBE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/youtube/v3/live/ {last visited September 2023); *Live Stream on YouTube Guide*, YouTube HELP DOCUMENTATION, available at: https://support.google.com/youtube/topic/9257891 (last visited September 2023); *Create a YouTube live stream with an encoder*, YOUTUBE HELP DOCUMENTATION, available at: https://support.google.com/youtube/answer/2907883 (last visited September 2023); *Delivering Live YouTube Content via DASH*, GOOGLE DEVELOPERS DOCUMENTATION (November 4, 2022), available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash; *Google I/O 2013 - Find the Next Big Thing with the YouTube Analytics API*, Google for Developer YouTube Channel (May 18, 2013); *From gQUIC to IETF QUIC and Beyond by Ian Swett*, MILE-HIGH VIDEO CONFERENCE PRESENTATION (November 30, 2020), available at: https://www.mile-high.video/past-event-mhv-23; *Adaptive Streaming for You and YouTube*, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s; *WebRTC based Live streaming in YouTube (YouTube)*, WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0; *ML Algorithms for Trust and Safety @ YouTube*, @SCALE YOUTUBE CHANNEL (June 16, 2023), available at: https://www.youtube.com/watch?v=zpoazJbi23U; and *Polymer @ YouTube (Polymer Summit 2017)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (August 22, 2017), available at: https://www.youtube.com/watch?v=tNulrEbTQf8.

least claim 9, Google specifically intended to induce infringement of the '664 patent. Google engaged in such inducement to promote the sales of the Google '664 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '664 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '664 patent, knowing that such use constitutes infringement of the '664 patent.

307. The '664 patent is well-known within the industry as demonstrated by multiple citations to the '664 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '664 patent without paying a reasonable royalty. Google is infringing the '664 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

308. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '664 patent.

309. As a result of Google's infringement of the '664 patent, Plaintiff has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT VIII
INFRINGEMENT OF U.S. PATENT NO. 7,987,285

310. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

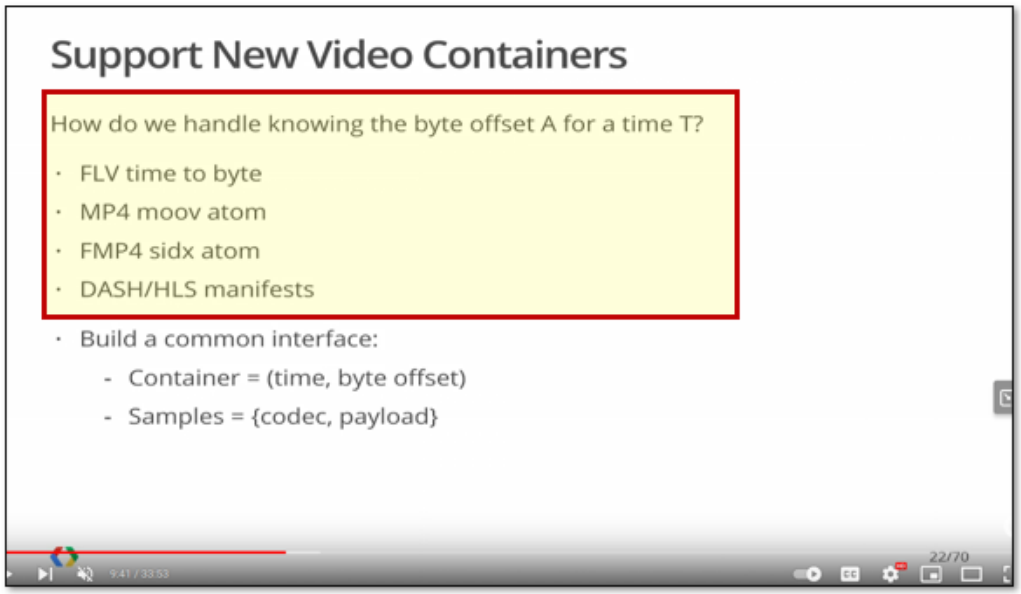
311. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for adaptive bitrate management for streaming media over packet networks.

312. Google designs, makes, sells, offers to sell, imports, and/or uses the following products: YouTube and Google Meet (collectively, the "Google '285 Product(s)").

313. One or more Google subsidiaries and/or affiliates use the Google '285 Products in regular business operations.

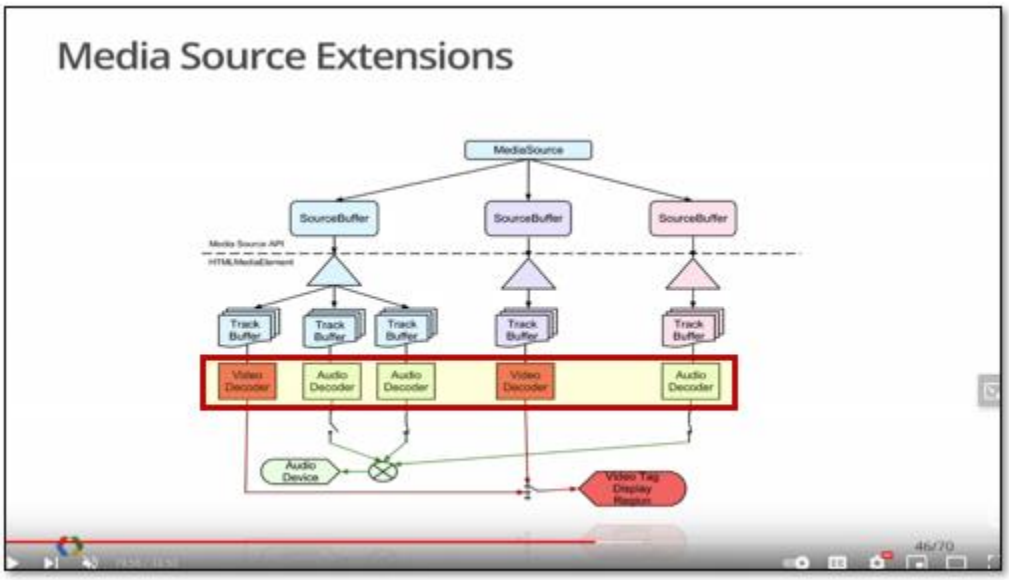
314. The Google '285 Products obtain a best-suited session bitrate.

315. The Google '285 Products initiate a session by leveraging an adaptive bitrate algorithm, to fetch the optimal session bitrate. This involves network probing to converge to an optimal bitrate that maximizes Quality of Experience (QoE) while minimizing re-buffering events and latency.



Adaptive Streaming for You and YouTube, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s (emphasis added).

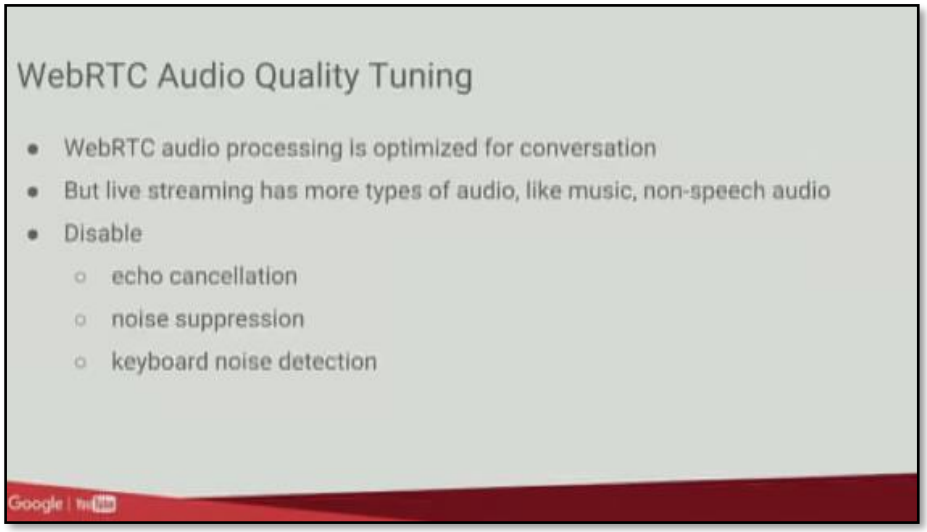
316. The Google '285 Products allocate the optimal session bitrate among audio and video streams to yield ideal bitrates for both, with the allocation partially based on giving precedence to either the audio or video data.



Adaptive Streaming for You and YouTube, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s (emphasis added).

317. The Google '285 Products partition the optimal session bitrate into audio and video components. This allocation is computed by accounting not only the intrinsic complexities of each media stream but also the current contextual priorities.

318. The Google '285 Products compress the audio and video content in accordance with the derived optimal audio and video bitrates.



WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0.

319. The Google '285 Products use specialized codecs for each media type—including the AAC (Advanced Audio Codec) for audio and H.264/AVC for video. These codecs utilize entropy coding, quantization, and transform techniques to compress the raw audio and video streams according to the pre-determined optimal bitrates. The encoding process employs CABAC (Context-Adaptive Binary Arithmetic Coding) for entropy coding and employing spatial and temporal prediction for further compression.

320. The Google '285 Products deliver compressed audio and video information for transmission to an end device.

321. The Google '285 Products encapsulate the encoded audio and video streams into a container format such as MPEG-4 Part 14 (.mp4) or Matroska (.mkv). This container is then chunked and packetized for delivery.

322. Google has directly infringed and continues to directly infringe the '285 patent by, among other things, making, using, offering for sale, and/or selling technology for adaptive bitrate

management for streaming media over packet networks, including but not limited to the Google '285 Products.

323. The Google '285 Products are available to businesses and individuals throughout the United States.

324. The Google '285 Products are provided to businesses and individuals located in this District.

325. By making, using, testing, offering for sale, and/or selling products and services comprising technology for adaptive bitrate management for streaming media over packet networks, including but not limited to the Google '285 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '285 patent, including at least claim 9 pursuant to 35 U.S.C. § 271(a).

326. Google also indirectly infringes the '285 patent by actively inducing infringement under 35 U.S.C. § 271(b).

327. Google has had knowledge of the '285 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '285 patent and knew of its infringement, including by way of this lawsuit.

328. Alternatively, Google has had knowledge of the '285 patent since at least May 16, 2017, based on its citation of the '285 patent as relevant prior art in 3 patents and patent applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent No. 9,654,528 (granted May 16, 2017)
- U.S. Patent No. 10,205,984 (granted February 12, 2019)
- U.S. Patent No. 10,659,832 (granted May 19, 2020)

329. In addition, Google has cited the '285 patent family in at least 16 patents and patent applications including the following patents and patent applications:

- U.S. Patent No. 8,495,237 (granted July 23, 2013)
- U.S. Patent No. 9,042,261 (granted May 26, 2015)
- U.S. Patent No. 9,106,787 (granted August 11, 2015)
- U.S. Patent No. 9,166,864 (granted October 20, 2015)
- U.S. Patent No. 9,172,740 (granted October 27, 2015)
- U.S. Patent No. 9,185,429 (granted November 10, 2015)
- U.S. Patent No. 9,210,420 (granted December 8, 2015)
- U.S. Patent No. 9,225,979 (granted December 29, 2015)
- U.S. Patent No. 9,311,692 (granted April 12, 2016)
- U.S. Patent No. 9,537,920 (granted January 3, 2017)
- U.S. Patent No. 9,560,392 (granted January 31, 2017)
- U.S. Patent No. 9,948,708 (granted April 17, 2018)
- U.S. Patent No. 10,728,302 (granted July 28, 2020)
- U.S. Patent Application No.2010/0306373 (published December 2, 2010)
- U.S. Patent Application No.2013/0311670 (published November 21, 2013)
- U.S. Patent Application No.2014/0074988 (published March 13, 2014)

330. Google intended to induce patent infringement by third-party customers and users of the Google '285 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '285 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '285 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '285 Products that have the capability of operating in a manner that infringe one or more of the claims of the '285 patent, including at least claim 9, and Google further provides documentation and training materials that cause customers and end users of the Google '285 Products to utilize the products in a manner that directly infringe one or more claims of the '285 patent.[21] By

[21] *See e.g., Get started with Meet for Google Workspace*, Google Workspace Learning Center, available at: https://support.google.com/a/users/answer/12836132 (last visited September 2023);

providing instruction and training to customers and end-users on how to use the Google '285 Products in a manner that directly infringes one or more claims of the '285 patent, including at least claim 9, Google specifically intended to induce infringement of the '285 patent. Google engaged in such inducement to promote the sales of the Google '285 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '285 patent. Accordingly, Google has

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Google Meet Help, Google Support Website, available at: https://support.google.com/meet/ (last visited September 2023); *Google Meet ToolKit – Workingly Remotely*, GOOGLE CLOUD DOCUMENTATION (May 2020); *Google Workspace Admin Help – Google Meet*, GOOGLE SUPPORT DOCUMENTATION, available at: https://support.google.com/a/topic/7302923 (last visited September 2023); *Tech Talk - Get to know Google Meet Video Conferencing*, GOOGLE CLOUD FORUM YOUTUBE CHANNEL (April 29, 2020), available at: https://www.youtube.com/watch?v=swgl395LiVk; *Background Features in Google Meet, Powered by Web ML*, GOOGLE RESEARCH BLOG (October 30, 2020), available at: https://blog.research.google/2020/10/background-features-in-google-meet.html?m=0; *Enabling Remote Working with Hangouts Meet and Hangouts Chat: A Quick Deployment Guide*, GOOGLE CLOUD DOCUMENTATION (2020); *WebRTC Update April 2014*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (April 10, 2014), available at: https://www.youtube.com/watch?v=DvzDzIXoncg&t=309s; *WebRTC Update 2017*, SFHTML5 YOUTUBE CHANNEL (October 28, 2017); available at: https://www.youtube.com/watch?v=PEXnbTyygi4; *WebRTC annual update 2022*, KRANKY GEEK YOUTUBE CHANNEL (December 13, 2022), available at: https://www.youtube.com/watch?v=WEUb-G4oSAg; Niklas Blum, Serge Lachapelle & Harald Alvestrand, *WebRTC: Real-Time Communication for the Open Web Platform*, 64 COMM. ACM 50 (2021); *YouTube Live Streaming API*, YOUTUBE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/youtube/v3/live/ {last visited September 2023); *Live Stream on YouTube Guide*, YouTube HELP DOCUMENTATION, available at: https://support.google.com/youtube/topic/9257891 (last visited September 2023); *Create a YouTube live stream with an encoder*, YOUTUBE HELP DOCUMENTATION, available at: https://support.google.com/youtube/answer/2907883 (last visited September 2023); *Delivering Live YouTube Content via DASH*, GOOGLE DEVELOPERS DOCUMENTATION (November 4, 2022), available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash; *Google I/O 2013 - Find the Next Big Thing with the YouTube Analytics API*, Google for Developer YouTube Channel (May 18, 2013); *From gQUIC to IETF QUIC and Beyond by Ian Swett*, MILE-HIGH VIDEO CONFERENCE PRESENTATION (November 30, 2020), available at: https://www.mile-high.video/past-event-mhv-23; *Adaptive Streaming for You and YouTube*, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s; *WebRTC based Live streaming in YouTube (YouTube)*, WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0; *ML Algorithms for Trust and Safety @ YouTube*, @SCALE YOUTUBE CHANNEL (June 16, 2023), available at: https://www.youtube.com/watch?v=zpoazJbi23U; and *Polymer @ YouTube (Polymer Summit 2017)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (August 22, 2017), available at: https://www.youtube.com/watch?v=tNulrEbTQf8.

induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '285 patent, knowing that such use constitutes infringement of the '285 patent.

331. The '285 patent is well-known within the industry as demonstrated by multiple citations to the '285 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '285 patent without paying a reasonable royalty. Google is infringing the '285 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

332. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '285 patent.

333. As a result of Google's infringement of the '285 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT IX
INFRINGEMENT OF U.S. PATENT NO. 7,991,904

334. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

335. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for adaptive bitrate management for streaming media over packet networks.

336. Google designs, makes, sells, offers to sell, imports, and/or uses the Google Meet product.

337. One or more Google subsidiaries and/or affiliates use Google Meet in regular business operations.

338. Google Meet acquires the best-suited session bitrate guided by the feedback from a TCP acknowledgement.

GOOGLE MEET PROTOCOL CAPTURE USING WIRESHARK (emphasis added) (note that the Google Meet server response contains RRTR messages to estimate the Round Trip Time and optimize the session bitrate).

339. Google Meet divides the acquired session bitrate between audio and video channels to yield ideal bitrates for both, where the division is partially based on giving a higher weight to either the audio or video stream.

340. Google Meet utilizes specified codecs to compress audio and video streams in accordance with the determined optimal audio and video bitrates.

GOOGLE MEET PROTOCOL CAPTURE USING WIRESHARK (emphasis added) (note that the Google Meet server response identifies the use of "useadaptivelayering" for the VP9 video codec).

341. Google Meet combines the compressed audio and video streams through a multiplexing operation.

342. Google Meet prepares the multiplexed audio and video streams for forwarding to an end terminal.

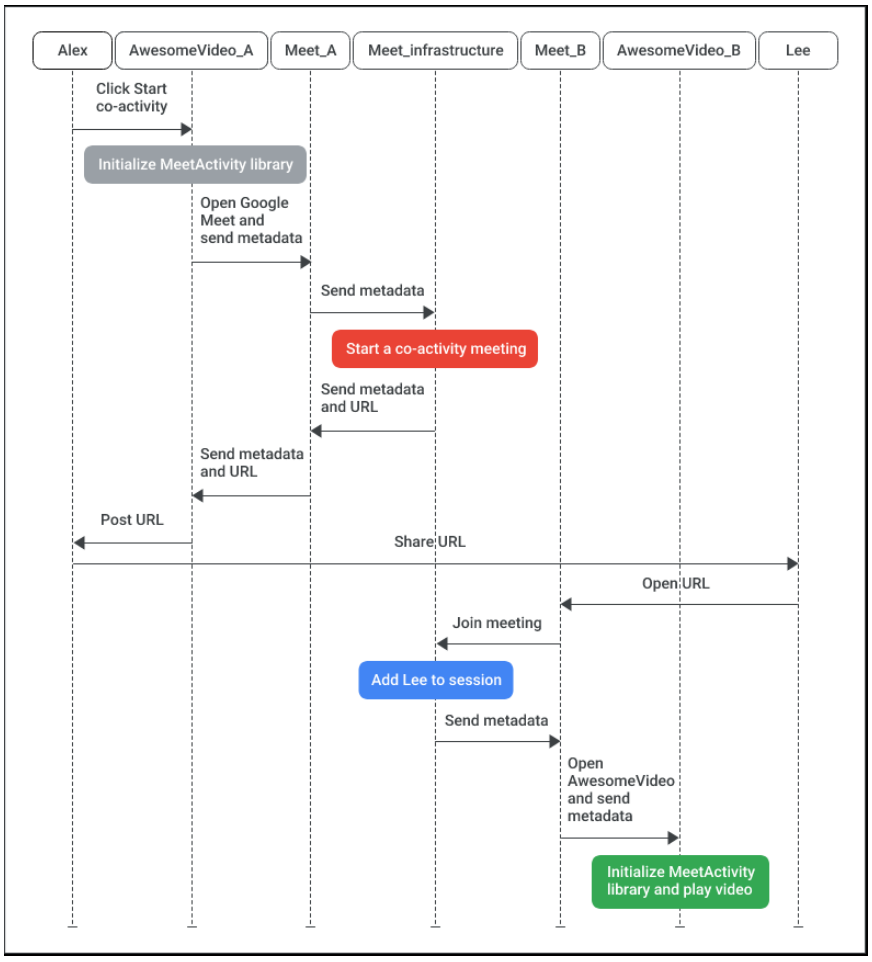
343. Google Meet employs a closed-loop control mechanism, where TCP acknowledgements are parsed to obtain Round-Trip Time (RTT) and packet loss metrics. These metrics are fed into a rate adaptation algorithm to ascertain an optimal session bitrate that maximizes throughput while minimizing latency.

344. Google Meet applies a bitrate allocation mechanism subject to the constraint of the optimal session bitrate. The allocation is adaptive to contextual elements to privilege either the audio or video stream.

345. Google Meet leverages codecs, such as ACC for audio and H.265/HEVC for video, that employ Vector Quantization, Discrete Cosine Transform (DCT), and motion compensation. The codecs used by Google Meet are optimized for the allocated optimal bitrates.

346. Google Meet utilizes Time Division Multiplexing (TDM) and/or Statistical Time Division Multiplexing (STDM) to interleave the encoded audio and video streams. Data packets

are annotated by Google Meet with appropriate headers and timestamps to facilitate downstream de-multiplexing.



Google Meet End-user Concepts, GOOGLE WORKSPACE DOCUMENTATION, available at: https://developers.google.com/meet/live-sharing/guides/concepts (last visited September 2023).

347. Google Meet encapsulates the multiplexed audio and video streams into a transport stream.

348. Google has directly infringed and continues to directly infringe the '904 patent by, among other things, making, using, offering for sale, and/or selling technology for adaptive bitrate management for streaming media over packet networks, including but not limited to Google Meet.

349. Google Meet is available to businesses and individuals throughout the United States.

350. Google Meet is provided to businesses and individuals located in this District.

351. By making, using, testing, offering for sale, and/or selling products and services comprising technology for adaptive bitrate management for streaming media over packet networks, including but not limited to Google Meet, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '904 patent, including at least claim 11 pursuant to 35 U.S.C. § 271(a).

352. Google also indirectly infringes the '904 patent by actively inducing infringement under 35 U.S.C. § 271(b).

353. Google has had knowledge of the '904 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '904 patent and knew of its infringement, including by way of this lawsuit.

354. Alternatively, Google has had knowledge of the '904 patent since at least July 23, 2013, based on its citation of the '904 patent as relevant prior art in 3 patents and patent applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent No. 8,495,237 (granted July 23, 2013)
- U.S. Patent No. 9,560,392 (granted January 31, 2017)
- U.S. Patent No. 10,728,302 (granted July 28, 2020)

355. In addition, Google has cited the '904 patent family in at least 16 patents and patent applications including the following patents and patent applications:

- U.S. Patent No. 9,042,261 (granted May 26, 2015)
- U.S. Patent No. 9,106,787 (granted August 11, 2015)
- U.S. Patent No. 9,166,864 (granted October 20, 2015)
- U.S. Patent No. 9,172,740 (granted October 27, 2015)
- U.S. Patent No. 9,185,429 (granted November 10, 2015)
- U.S. Patent No. 9,210,420 (granted December 8, 2015)
- U.S. Patent No. 9,225,979 (granted December 29, 2015)
- U.S. Patent No. 9,311,692 (granted April 12, 2016)

- U.S. Patent No. 9,537,920 (granted January 3, 2017)
- U.S. Patent No. 9,654,528 (granted May 16, 2017)
- U.S. Patent No. 9,948,708 (granted April 17, 2018)
- U.S. Patent No. 10,205,984 (granted February 12, 2019)
- U.S. Patent No. 10,659,832 (granted May 19, 2020)
- U.S. Patent Application No.2010/0306373 (published December 2, 2010)
- U.S. Patent Application No.2013/0311670 (published November 21, 2013)
- U.S. Patent Application No.2014/0074988 (published March 13, 2014)

356. Google intended to induce patent infringement by third-party customers and users of Google Meet and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '904 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '904 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides Google Meet that has the capability of operating in a manner that infringe one or more of the claims of the '904 patent, including at least claim 11, and Google further provides documentation and training materials that cause customers and end users of Google Meet to utilize the product in a manner that directly infringe one or more claims of the '904 patent.[22] By providing instruction and training

[22] *See e.g., Get started with Meet for Google Workspace*, Google Workspace Learning Center, available at: https://support.google.com/a/users/answer/12836132 (last visited September 2023); *Google Meet Help*, Google Support Website, available at: https://support.google.com/meet/ (last visited September 2023); *Google Meet ToolKit – Workingly Remotely*, GOOGLE CLOUD DOCUMENTATION (May 2020); *Google Workspace Admin Help – Google Meet*, GOOGLE SUPPORT DOCUMENTATION, available at: https://support.google.com/a/topic/7302923 (last visited September 2023); *Tech Talk - Get to know Google Meet Video Conferencing*, GOOGLE CLOUD FORUM YOUTUBE CHANNEL (April 29, 2020), available at: https://www.youtube.com/watch?v=swgl395LiVk; *Background Features in Google Meet, Powered by Web ML*, GOOGLE RESEARCH BLOG (October 30, 2020), available at: https://blog.research.google/2020/10/background-features-in-google-meet.html?m=0; *Enabling Remote Working with Hangouts Meet and Hangouts Chat: A Quick Deployment Guide*, GOOGLE CLOUD DOCUMENTATION (2020); *WebRTC Update April 2014*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (April 10, 2014), available at: https://www.youtube.com/watch?v=DvzDzIXoncg&t=309s; *WebRTC Update 2017*, SFHTML5 YOUTUBE CHANNEL (October 28, 2017); available at:

to customers and end-users on how to use Google Meet in a manner that directly infringes one or more claims of the '904 patent, including at least claim 11, Google specifically intended to induce infringement of the '904 patent. Google engaged in such inducement to promote the sales and use of Google Meet, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '904 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '904 patent, knowing that such use constitutes infringement of the '904 patent.

357. The '904 patent is well-known within the industry as demonstrated by multiple citations to the '904 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '904 patent without paying a reasonable royalty. Google is infringing the '904 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

358. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '904 patent.

359. As a result of Google's infringement of the '904 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

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https://www.youtube.com/watch?v=PEXnbTyygi4; *WebRTC annual update 2022*, KRANKY GEEK YOUTUBE CHANNEL (December 13, 2022), available at: https://www.youtube.com/watch?v=WEUb-G4oSAg; and Niklas Blum, Serge Lachapelle & Harald Alvestrand, *WebRTC: Real-Time Communication for the Open Web Platform*, 64 COMM. ACM 50 (2021).

COUNT X
INFRINGEMENT OF U.S. PATENT NO. 8,230,105

360. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

361. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising streaming technology that optimizes audio-video bitrate allocation.

362. Google designs, makes, sells, offers to sell, imports, and/or uses the following products: YouTube and Google Meet (collectively, the "Google '105 Product(s)").

363. One or more Google subsidiaries and/or affiliates use the Google '105 Products in regular business operations.

364. The Google '105 Products obtain an optimal session bitrate for media streaming.

365. The Google '105 Products receive an optimal session bitrate. Specifically, this determination is based on one or more factors including network conditions, available bandwidth, and device capabilities.

366. The Google '105 Products divide this optimal session bitrate between audio and video data to yield the best-suited bitrates for each.

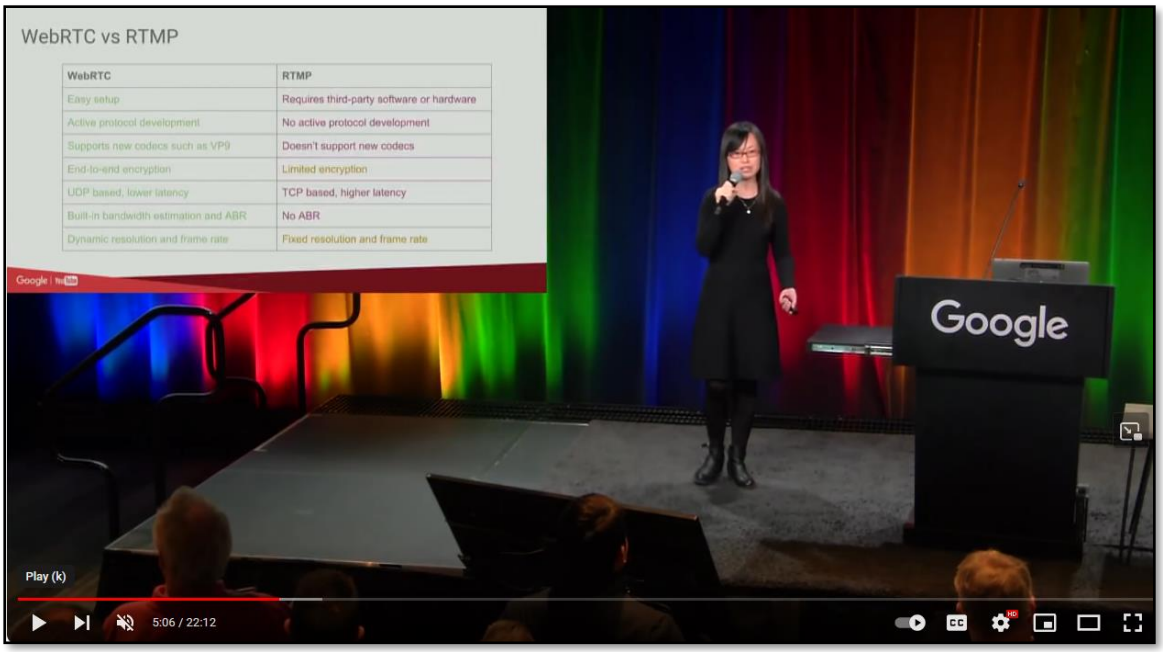
367. The Google '105 Products allocate the optimal session bitrate between audio and video media data to produce an optimal audio bitrate and an optimal video bitrate, wherein allocating the optimal session bitrate between audio and video media data is based on a metric selected from a group including a predetermined allocation, a user preference, an optimal performance data, privileging one type of data over the other, and an amount of audio and video media data to be provided.

368. The Google '105 Products are responsible for calculating or receiving an optimal session bitrate based on network conditions and/or the client's capabilities.

GOOGLE MEET PROTOCOL CAPTURE USING WIRESHARK (emphasis added) (note that the Google Meet server response contains RRTR messages to estimate the Round Trip Time and optimize the session bitrate).

369. The Google '105 Products base the bitrate allocation on criteria chosen from a set that includes pre-defined ratios, user settings, performance metrics, prioritizing one media type over the other, and the volume of audio and video data to be delivered.

370. The bitrate allocation used by the Google '105 Products is based on a metric selected from a group including a predetermined allocation, a user preference, an optimal performance data, privileging one type of data over the other, and an amount of audio and video media data to be provided.

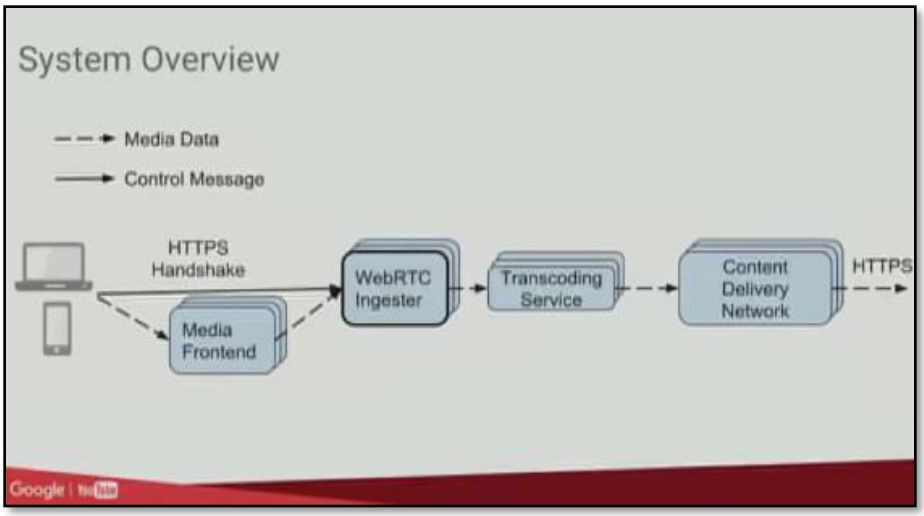


WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0 ("Another big advantage of WebRTC is that is has built-in-bandwidth estimation adaptive bitrate, this is very use for mobile live streaming . . so WebRTC does dynamic resolution changing.").

371. The Google '105 Products compress the audio and video content as per the determined optimal audio and video bitrates.

372. The Google '105 Products encode audio and video media data according to the optimal audio bitrate and the optimal video bitrate.

373. The Google '105 Products make available the compressed audio and video streams for forwarding to an end device.



WebRTC based Live streaming in YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0.

374. The Google '105 Products encode audio and video media data according to the optimal audio bitrate and the optimal video bitrate. This is achieved through utilizing encoding algorithms that are tailored to the bitrates allocated for each type of media. By compressing the media data according to these specific bitrates, the system ensures that the audio and video streams are packaged in a way that maximizes quality while adhering to the bandwidth limitations.

375. Google has directly infringed and continues to directly infringe the '105 patent by, among other things, making, using, offering for sale, and/or selling streaming technology that optimizes audio-video bitrate allocation, including but not limited to the Google '105 Products.

376. The Google '105 Products are available to businesses and individuals throughout the United States.

377. The Google '105 Products are provided to businesses and individuals located in this District.

378. By making, using, testing, offering for sale, and/or selling products and services comprising streaming technology that optimizes audio-video bitrate allocation, including but not limited to the Google '105 Products, Google has injured Plaintiff and is liable to Plaintiff for

directly infringing one or more claims of the '105 patent, including at least claim 16 pursuant to 35 U.S.C. § 271(a).

379. Google also indirectly infringes the '105 patent by actively inducing infringement under 35 U.S.C. § 271(b).

380. Google has had knowledge of the '105 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '105 patent and knew of its infringement, including by way of this lawsuit.

381. Alternatively, Google has had knowledge of the '105 patent since at least July 24, 2012, based on its citation of the '105 patent family as relevant prior art in at least 19 patents and patent applications that are assigned to and owned by Google:

- U.S. Patent No. 8,495,237 (granted July 23, 2013)
- U.S. Patent No. 9,042,261 (granted May 26, 2015)
- U.S. Patent No. 9,106,787 (granted August 11, 2015)
- U.S. Patent No. 9,166,864 (granted October 20, 2015)
- U.S. Patent No. 9,172,740 (granted October 27, 2015)
- U.S. Patent No. 9,185,429 (granted November 10, 2015)
- U.S. Patent No. 9,210,420 (granted December 8, 2015)
- U.S. Patent No. 9,225,979 (granted December 29, 2015)
- U.S. Patent No. 9,311,692 (granted April 12, 2016)
- U.S. Patent No. 9,537,920 (granted January 3, 2017)
- U.S. Patent No. 9,560,392 (granted January 31, 2017)
- U.S. Patent No. 9,654,528 (granted May 16, 2017)
- U.S. Patent No. 9,948,708 (granted April 17, 2018)
- U.S. Patent No. 10,205,984 (granted February 12, 2019)
- U.S. Patent No. 10,659,832 (granted May 19, 2020)
- U.S. Patent No. 10,728,302 (granted July 28, 2020)
- U.S. Patent Application No.2010/0306373 (published December 2, 2010)
- U.S. Patent Application No.2013/0311670 (published November 21, 2013)
- U.S. Patent Application No.2014/0074988 (published March 13, 2014)

382. Google intended to induce patent infringement by third-party customers and users of the Google '105 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google

specifically intended and was aware that the normal and customary use of the accused products would infringe the '105 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '105 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '105 Products that have the capability of operating in a manner that infringe one or more of the claims of the '105 patent, including at least claim 16, and Google further provides documentation and training materials that cause customers and end users of the Google '105 Products to utilize the products in a manner that directly infringe one or more claims of the '105 patent.[23] By

[23] *See e.g., Get started with Meet for Google Workspace*, Google Workspace Learning Center, available at: https://support.google.com/a/users/answer/12836132 (last visited September 2023); *Google Meet Help*, Google Support Website, available at: https://support.google.com/meet/ (last visited September 2023); *Google Meet ToolKit – Workingly Remotely*, GOOGLE CLOUD DOCUMENTATION (May 2020); *Google Workspace Admin Help – Google Meet*, GOOGLE SUPPORT DOCUMENTATION, available at: https://support.google.com/a/topic/7302923 (last visited September 2023); *Tech Talk - Get to know Google Meet Video Conferencing*, GOOGLE CLOUD FORUM YOUTUBE CHANNEL (April 29, 2020), available at: https://www.youtube.com/watch?v=swgl395LiVk; *Background Features in Google Meet, Powered by Web ML*, GOOGLE RESEARCH BLOG (October 30, 2020), available at: https://blog.research.google/2020/10/background-features-in-google-meet.html?m=0; *Enabling Remote Working with Hangouts Meet and Hangouts Chat: A Quick Deployment Guide*, GOOGLE CLOUD DOCUMENTATION (2020); *WebRTC Update April 2014*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (April 10, 2014), available at: https://www.youtube.com/watch?v=DvzDzIXoncg&t=309s; *WebRTC Update 2017*, SFHTML5 YOUTUBE CHANNEL (October 28, 2017); available at: https://www.youtube.com/watch?v=PEXnbTyygi4; *WebRTC annual update 2022*, KRANKY GEEK YOUTUBE CHANNEL (December 13, 2022), available at: https://www.youtube.com/watch?v=WEUb-G4oSAg; Niklas Blum, Serge Lachapelle & Harald Alvestrand, *WebRTC: Real-Time Communication for the Open Web Platform*, 64 COMM. ACM 50 (2021); *YouTube Live Streaming API*, YOUTUBE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/youtube/v3/live/ {last visited September 2023); *Live Stream on YouTube Guide*, YouTube HELP DOCUMENTATION, available at: https://support.google.com/youtube/topic/9257891 (last visited September 2023); *Create a YouTube live stream with an encoder*, YOUTUBE HELP DOCUMENTATION, available at: https://support.google.com/youtube/answer/2907883 (last visited September 2023); *Delivering Live YouTube Content via DASH*, GOOGLE DEVELOPERS DOCUMENTATION (November 4, 2022), available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash; *Google I/O 2013 - Find the Next Big Thing with the YouTube Analytics API*, Google for Developer YouTube Channel (May 18, 2013); *From gQUIC to IETF QUIC and Beyond by Ian Swett*, MILE-HIGH VIDEO CONFERENCE PRESENTATION (November 30, 2020), available at: https://www.mile-high.video/past-event-mhv-23; *Adaptive Streaming for You and YouTube*, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s; *WebRTC based Live streaming in*

providing instruction and training to customers and end-users on how to use the Google '105 Products in a manner that directly infringes one or more claims of the '105 patent, including at least claim 16, Google specifically intended to induce infringement of the '105 patent. Google engaged in such inducement to promote the sales of the Google '105 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '105 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '105 patent, knowing that such use constitutes infringement of the '105 patent.

383. The '105 patent is well-known within the industry as demonstrated by multiple citations to the '105 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '105 patent without paying a reasonable royalty. Google is infringing the '105 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

384. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '105 patent.

385. As a result of Google's infringement of the '105 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's

YouTube (YouTube), WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0; *ML Algorithms for Trust and Safety @ YouTube*, @SCALE YOUTUBE CHANNEL (June 16, 2023), available at: https://www.youtube.com/watch?v=zpoazJbi23U; and *Polymer @ YouTube (Polymer Summit 2017)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (August 22, 2017), available at: https://www.youtube.com/watch?v=tNulrEbTQf8.

infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT XI
INFRINGEMENT OF U.S. PATENT NO. 8,769,141

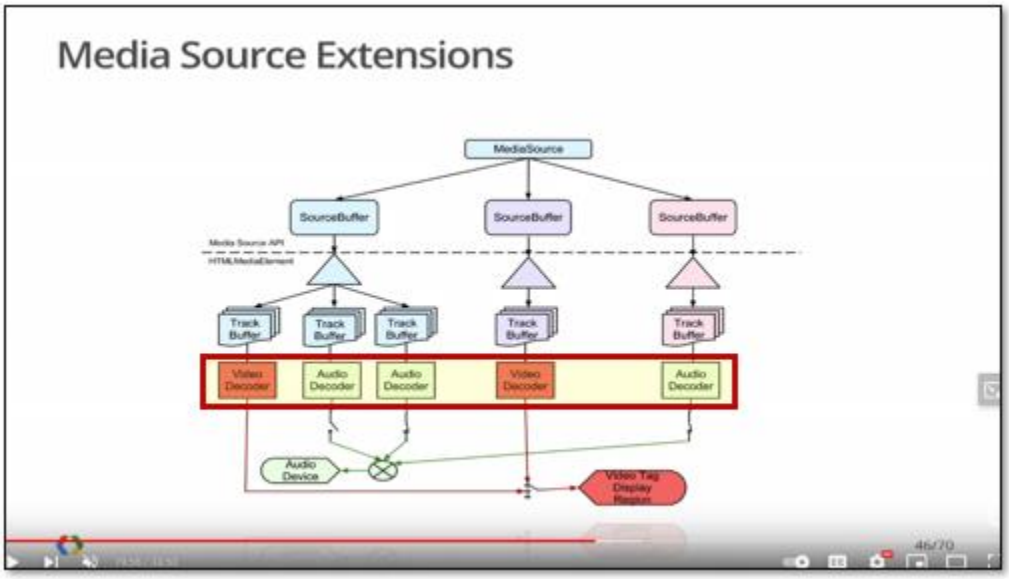
386. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

387. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for encoding media data using optimal audio and video bitrates and multiplexing the data for transmission.

388. Google designs, makes, sells, offers to sell, imports, and/or uses YouTube.

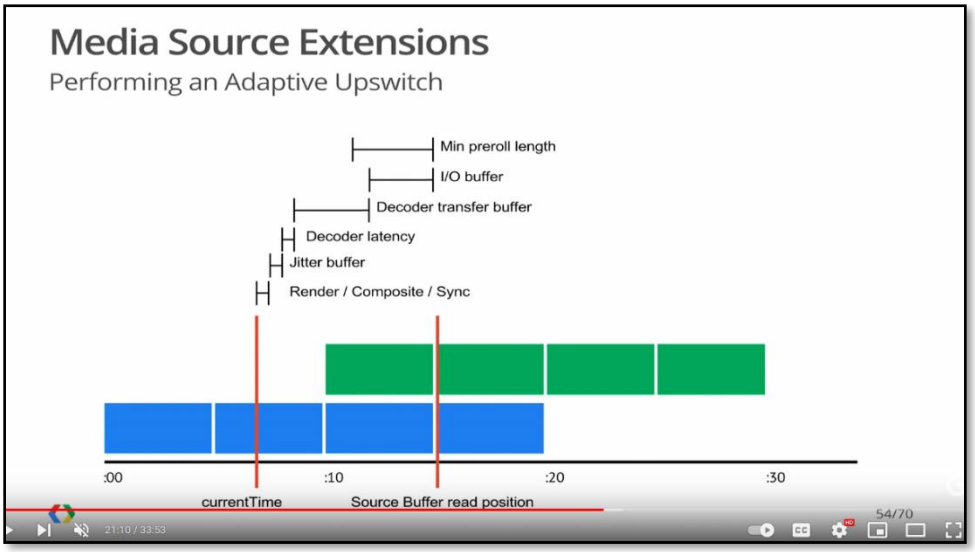
389. One or more Google subsidiaries and/or affiliates use YouTube in regular business operations.

390. YouTube receives both audio and video data.



Adaptive Streaming for You and YouTube, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s (emphasis added).

391. YouTube receives media streams, which include both audio and video data. Specifically, YouTube uses a manifest and segment retrieval process based on the products implementation of MPEG-DASH.

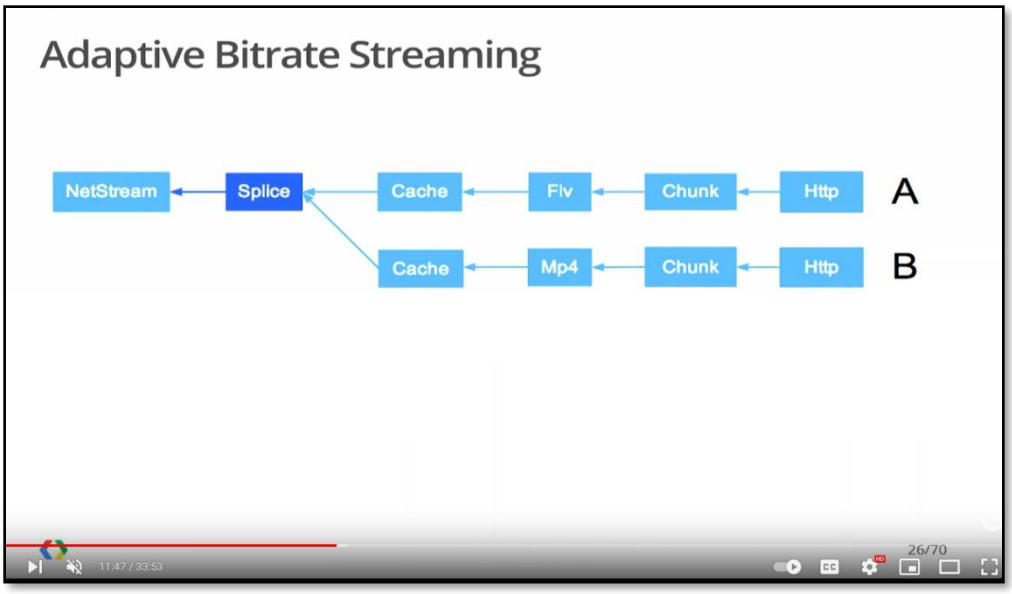


Adaptive Streaming for You and YouTube, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s

392. YouTube obtains an optimal session bitrate.

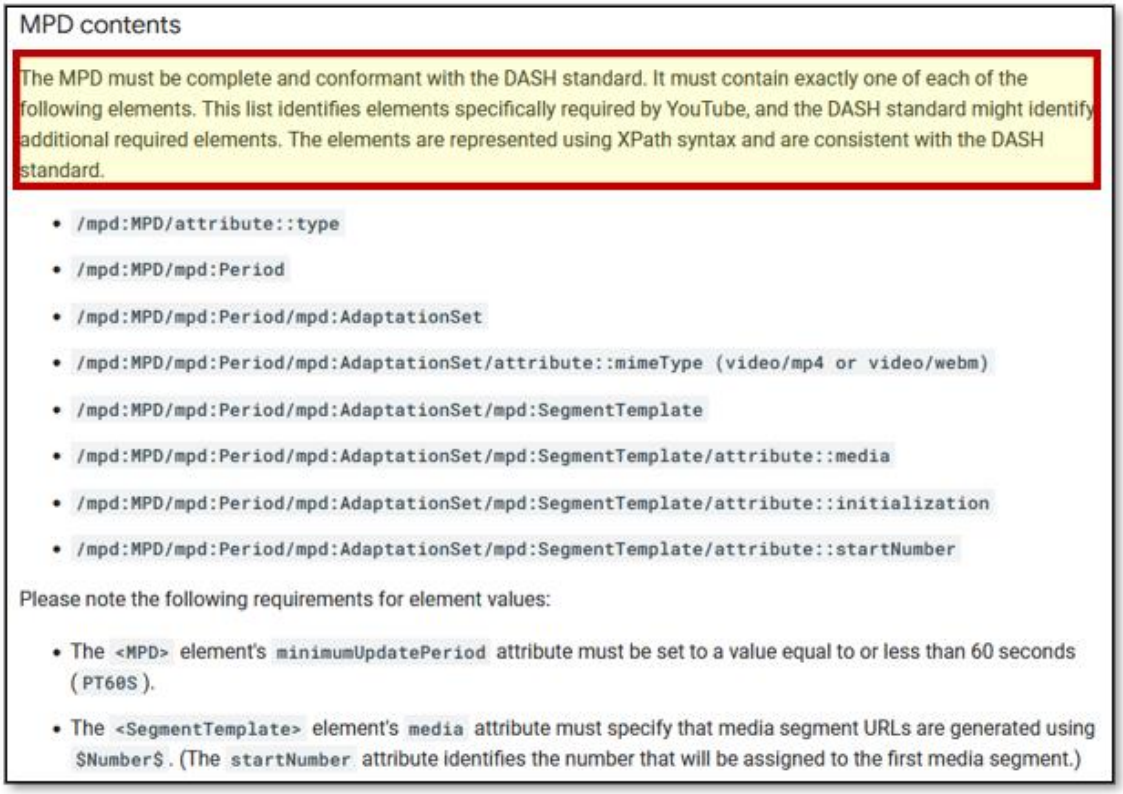
393. YouTube employs an ABR algorithm to determine an optimal session bitrate. Specifically, YouTube implements MPEG-DASH and an optimal session bitrate is on metadata, like bitrates and resolutions of available segments, that are used to determine the optimal session bitrate.

394. YouTube apportions the recommended session bitrate among audio and video streams, favoring either audio or video for a higher bitrate as needed.



Adaptive Streaming for You and YouTube, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s

395. YouTube partitions the optimal session bitrate between audio and video components. Specifically, through incorporation of MPEG-DASH adaptive bitrate management, YouTube utilizes a manifest that contains information on the available bitrates for both audio and video, enabling the allocation of bitrates between the audio and video data.



MPD contents

The MPD must be complete and conformant with the DASH standard. It must contain exactly one of each of the following elements. This list identifies elements specifically required by YouTube, and the DASH standard might identify additional required elements. The elements are represented using XPath syntax and are consistent with the DASH standard.

- `/mpd:MPD/attribute::type`
- `/mpd:MPD/mpd:Period`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet/attribute::mimeType (video/mp4 or video/webm)`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet/mpd:SegmentTemplate`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet/mpd:SegmentTemplate/attribute::media`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet/mpd:SegmentTemplate/attribute::initialization`
- `/mpd:MPD/mpd:Period/mpd:AdaptationSet/mpd:SegmentTemplate/attribute::startNumber`

Please note the following requirements for element values:

- The `<MPD>` element's `minimumUpdatePeriod` attribute must be set to a value equal to or less than 60 seconds (`PT60S`).
- The `<SegmentTemplate>` element's `media` attribute must specify that media segment URLs are generated using `$Number$`. (The `startNumber` attribute identifies the number that will be assigned to the first media segment.)

Delivering Live YouTube Content via DASH, YOUTUBE LIVE STREAMING API, available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash (last visited September 2023) (emphasis added).

396. YouTube compresses the audio stream according to its optimal bitrate.

397. YouTube compresses the video stream using its designated optimal bitrate.

398. YouTube multiplexes the compressed audio and video data.

399. YouTube prepares the multiplexed audio and video data for dispatch to a terminal device.

400. Google has directly infringed and continues to directly infringe the '141 patent by, among other things, making, using, offering for sale, and/or selling technology for encoding media data using optimal audio and video bitrates and multiplexing the data for transmission, including but not limited to YouTube.

401. YouTube is available to businesses and individuals throughout the United States.

402. YouTube is provided to businesses and individuals located in this District.

403. By making, using, testing, offering for sale, and/or selling products and services comprising technology for encoding media data using optimal audio and video bitrates and multiplexing the data for transmission, including but not limited YouTube, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '141 patent, including at least claim 20 pursuant to 35 U.S.C. § 271(a).

404. Google also indirectly infringes the '141 patent by actively inducing infringement under 35 U.S.C. § 271(b).

405. Google has had knowledge of the '141 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '141 patent and knew of its infringement, including by way of this lawsuit.

406. Alternatively, Google has had knowledge of the '141 patent since at least July 1, 2014, based on its citation of the '141 patent family as relevant prior art in 19 patents and patent applications that are assigned to and owned by Google. These patents and patent applications include:

- U.S. Patent No. 8,495,237 (granted July 23, 2013)
- U.S. Patent No. 9,042,261 (granted May 26, 2015)
- U.S. Patent No. 9,106,787 (granted August 11, 2015)
- U.S. Patent No. 9,166,864 (granted October 20, 2015)
- U.S. Patent No. 9,172,740 (granted October 27, 2015)
- U.S. Patent No. 9,185,429 (granted November 10, 2015)
- U.S. Patent No. 9,210,420 (granted December 8, 2015)
- U.S. Patent No. 9,225,979 (granted December 29, 2015)
- U.S. Patent No. 9,311,692 (granted April 12, 2016)
- U.S. Patent No. 9,537,920 (granted January 3, 2017)
- U.S. Patent No. 9,560,392 (granted January 31, 2017)
- U.S. Patent No. 9,654,528 (granted May 16, 2017)
- U.S. Patent No. 9,948,708 (granted April 17, 2018)
- U.S. Patent No. 10,205,984 (granted February 12, 2019)
- U.S. Patent No. 10,659,832 (granted May 19, 2020)

- U.S. Patent No. 10,728,302 (granted July 28, 2020)
- U.S. Patent Application No.2010/0306373 (published December 2, 2010)
- U.S. Patent Application No.2013/0311670 (published November 21, 2013)
- U.S. Patent Application No.2014/0074988 (published March 13, 2014)

407. Google intended to induce patent infringement by third-party customers and users of YouTube and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '141 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '141 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides YouTub, which has the capability of operating in a manner that infringe one or more of the claims of the '141 patent, including at least claim 20, and Google further provides documentation and training materials that cause customers and end users of YouTube to utilize the products in a manner that directly infringe one or more claims of the '141 patent.[24] By providing instruction and training to customers and

[24] *See e.g., YouTube Live Streaming API*, YOUTUBE DEVELOPER DOCUMENTATION, available at: https://developers.google.com/youtube/v3/live/ {last visited September 2023); *Live Stream on YouTube Guide*, YouTube HELP DOCUMENTATION, available at: https://support.google.com/youtube/topic/9257891 (last visited September 2023); *Create a YouTube live stream with an encoder*, YOUTUBE HELP DOCUMENTATION, available at: https://support.google.com/youtube/answer/2907883 (last visited September 2023); *Delivering Live YouTube Content via DASH*, GOOGLE DEVELOPERS DOCUMENTATION (November 4, 2022), available at: https://developers.google.com/youtube/v3/live/guides/encoding-with-dash; *Google I/O 2013 - Find the Next Big Thing with the YouTube Analytics API*, Google for Developer YouTube Channel (May 18, 2013); *From gQUIC to IETF QUIC and Beyond by Ian Swett*, MILE-HIGH VIDEO CONFERENCE PRESENTATION (November 30, 2020), available at: https://www.mile-high.video/past-event-mhv-23; *Adaptive Streaming for You and YouTube*, GOOGLE FOR DEVELOPERS YOUTUBE CHANNEL (May 18, 2013), available at: https://www.youtube.com/watch?v=UklDSMG9ffU&t=1804s; *WebRTC based Live streaming in YouTube (YouTube)*, WEBRTC BOSTON YOUTUBE CHANNEL (February 25, 2019), available at: https://www.youtube.com/watch?v=htN-gIPOkP0; *ML Algorithms for Trust and Safety @ YouTube*, @SCALE YOUTUBE CHANNEL (June 16, 2023), available at: https://www.youtube.com/watch?v=zpoazJbi23U; and *Polymer @ YouTube (Polymer Summit 2017)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (August 22, 2017), available at: https://www.youtube.com/watch?v=tNulrEbTQf8.

end-users on how to use YouTube in a manner that directly infringes one or more claims of the '141 patent, including at least claim 20, Google specifically intended to induce infringement of the '141 patent. Google engaged in such inducement to promote the sales and/or use of YouTube, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '141 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '141 patent, knowing that such use constitutes infringement of the '141 patent.

408. The '141 patent is well-known within the industry as demonstrated by multiple citations to the '141 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '141 patent without paying a reasonable royalty. Google is infringing the '141 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

409. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '141 patent.

410. As a result of Google's infringement of the '141 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT XII
INFRINGEMENT OF U.S. PATENT NO. 10,412,388

411. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

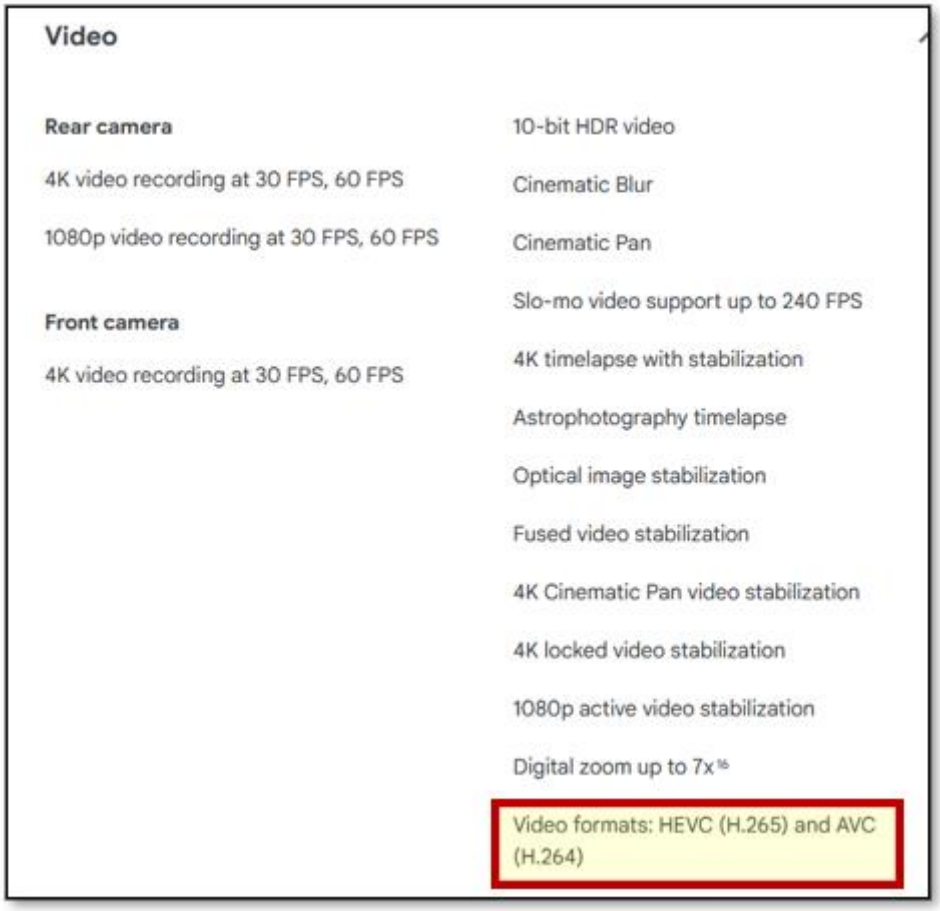
412. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for video compression using adaptive re-quantization using extracted and derived quantization parameters.

413. Google designs, makes, sells, offers to sell, imports, and/or uses the Google Cloud Platform (GCP) including the Transcoder API, Google devices (e.g., Google Chromecast Ultra, Google Cast, Google Pixel 7 and later versions), and Android 12 and later versions (and all versions and variations thereof) (collectively, the "Google '388 Product(s)").

414. Google designs, makes, sells, offers to sell, imports, and/or uses Google '388 products that comply with the H.265 video encoding standard.

415. The Google '388 Products perform video processing compliant with the High Efficiency Video Coding (HEVC) standard, which is also often referred to as the H.265 standard. Specifically, the Google '388 products perform HEVC encoding.

416. One or more Google subsidiaries and/or affiliates use the Google '388 Products in regular business operations.



Video

Rear camera

4K video recording at 30 FPS, 60 FPS

1080p video recording at 30 FPS, 60 FPS

Front camera

4K video recording at 30 FPS, 60 FPS

10-bit HDR video

Cinematic Blur

Cinematic Pan

Slo-mo video support up to 240 FPS

4K timelapse with stabilization

Astrophotography timelapse

Optical image stabilization

Fused video stabilization

4K Cinematic Pan video stabilization

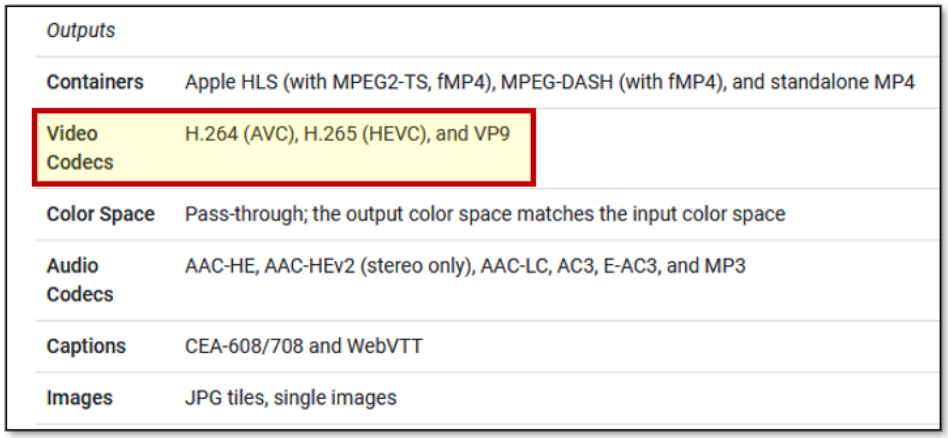
4K locked video stabilization

1080p active video stabilization

Digital zoom up to 7x[16]

Video formats: HEVC (H.265) and AVC (H.264)

Google Pixel 7 Technical Specifications, GOOGLE WEBSITE, available at: https://store.google.com/product/pixel_7_specs (last visited September 2023) (emphasis added).



Outputs	
Containers	Apple HLS (with MPEG2-TS, fMP4), MPEG-DASH (with fMP4), and standalone MP4
Video Codecs	H.264 (AVC), H.265 (HEVC), and VP9
Color Space	Pass-through; the output color space matches the input color space
Audio Codecs	AAC-HE, AAC-HEv2 (stereo only), AAC-LC, AC3, E-AC3, and MP3
Captions	CEA-608/708 and WebVTT
Images	JPG tiles, single images

Supported input and output formats – Google Cloud Transcoder API, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/transcoder/docs/concepts/supported-input-and-output-formats (last visited September 2023) (emphasis added).

417. The Google ‘388 Products identify an initial quantization parameter employed to compress a previously decoded frame.

418. The Google ‘388 Products, as part of the encoding process use an initial quantization parameter (QP) for encoding each frame or coding unit (CU). In conforming to the HEVC standard, the Google ‘388 Products must set an initial QP value that serves as the baseline for encoding the decoded frame.

419. The Google ‘388 Products calculate a delta quantization parameter as influenced by the initial quantization parameter, where the function is designed to yield this delta parameter at least in part to achieve a bitrate reduction while sustaining a given quality threshold.

420. The Google ‘388 Products calculate a delta QP based on the initial quantization parameter. This function aims to minimize bitrate while retaining the required video quality.

421. The Google ‘388 Products ascertain a subsequent quantization parameter for the purpose of compressing the decoded frame, based on both the initial and delta quantization parameters.

422. The Google ‘388 Products determine a second quantization parameter using the initial QP and the delta QP. The Google ‘388 Products calculate the second quantization parameter as QP1 + Delta QP. This second quantization parameter is the one used for encoding either the entire frame or specific coding units within the frame.

423. The Google ‘388 Products compress the decoded frame utilizing the second quantization parameter.

424. The Google ‘388 Products encode the video frames using the newly derived second quantization parameter.

425. By complying with the HEVC standard, the Google '388 Products necessarily infringe the '388 patent. Mandatory sections of the HEVC standard require the elements required by certain claims of the '388 patent, including but not limited to claim 1. High Efficiency Video Coding, Series H: Audiovisual And Multimedia Systems: Infrastructure Of Audiovisual Services – Coding Of Moving Video Rec. ITU-T H.265 (August 2021). The following sections of the HEVC Standard are relevant to Google's infringement of the '388 patent: "7.3.2.2.3 Sequence parameter set screen content coding extension syntax;" "7.3.8.4 Coding quadtree syntax;" "7.3.8.14 Delta QP syntax;" "7.4.3.3.1 General picture parameter set RBSP semantics;" "7.4.7.1 General slice segment header semantics;" "7.4.9.14 Delta QP semantics;" "8.6.1 Derivation process for quantization parameters;" and "9.3.3.10 Binarization process for cu_qp_delta_abs."

426. All implementations of the HEVC standard necessarily infringe the '388 patent as every implementation of the standard requires compliant devices to carry out the following: Each frame or coding unit (CU) is encoded using a pre-defined initial Quantization Parameter (QP) which serves as a baseline for various optimizations. The standard mandates that a first QP (QP1) be identified before any encoding can occur. The Google '388 Products are, therefore, required to have mechanisms to set this initial QP1 for the to-be-encoded (or re-encoded) frame. Further, the HEVC standard sets out a structured way to adjust this initial QP based on a delta value. The objective of introducing a delta QP is generally to adapt to the complexity variations within a video sequence and to optimize rate-distortion performance. The HEVC encoding standard sets forth calculating a new QP (QP2) after determining the delta QP. This is done by adding the initial QP (QP1) and the delta QP. This step is essential for maintaining granular control over the rate-distortion tradeoff during encoding. Finally, the final encoding of the frame or CU takes place using QP2. The HEVC standard specifies that this is a requisite step for the encoding process to

be considered compliant. The Google '388 Products must, therefore, encode frames using this newly computed QP2 to meet the standard's rate and quality stipulations.

427. Google has directly infringed and continues to directly infringe the '388 patent by, among other things, making, using, offering for sale, and/or selling technology for video compression using adaptive re-quantization using extracted and derived quantization parameters, including but not limited to the Google '388 Products.

428. The Google '388 Products are available to businesses and individuals throughout the United States.

429. The Google '388 Products are provided to businesses and individuals located in this District.

430. By making, using, testing, offering for sale, and/or selling products and services comprising technology for video compression using adaptive re-quantization using extracted and derived quantization parameters, including but not limited to the Google '388 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '388 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

431. Google also indirectly infringes the '388 patent by actively inducing infringement under 35 U.S.C. § 271(b).

432. Google has had knowledge of the '388 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '388 patent and knew of its infringement, including by way of this lawsuit.

433. Google intended to induce patent infringement by third-party customers and users of the Google '388 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google

specifically intended and was aware that the normal and customary use of the accused products would infringe the '388 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '388 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '388 Products that have the capability of operating in a manner that infringe one or more of the claims of the '388 patent, including at least claim 1, and Google further provides documentation and training materials that cause customers and end users of the Google '388 Products to utilize the products in a manner that directly infringe one or more claims of the '388 patent.[25] By providing instruction and training to customers and end-users on how to use the Google '388 Products in a manner that directly infringes one or more claims of the '388 patent, including at least claim 1, Google specifically intended to induce infringement of the '388 patent. Google engaged in such inducement to promote the sales of the Google '388 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '388 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their

[25] *See e.g., Transcoding & Archiving on GCP*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (June 5, 2015), available at: https://www.youtube.com/watch?v=tG8uPjF9hoE&t; *Google Transcoder API Overview*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/transcoder/docs/concepts/overview (last visited September 2023); *Supercharge performance using GPUs in the cloud (Google Cloud Next '17)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (March 20, 2017), available at: https://www.youtube.com/watch?v=qESRdJy9WdE&t; *Google Cloud Transcoder API Release Notes*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/transcoder/docs/release-notes (last visited (September 2023); *Google Transcoder RPC Reference Library*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/transcoder/docs/reference/rpc (last visited September 2023); *Introduction to Video Intelligence (Google Cloud Next '17)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (March 10l, 2017), available at: https://www.youtube.com/watch?v=y-k8oelbmGc; and *GCP Network and Security Telemetry (Cloud Next '18)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (Julu 24, 2018); https://www.youtube.com/watch?v=as9mXNEcaDo.

ordinary and customary way to infringe the '388 patent, knowing that such use constitutes infringement of the '388 patent.

434. The '388 patent is well-known within the industry as demonstrated by multiple citations to the '388 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '388 patent without paying a reasonable royalty. Google is infringing the '388 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

435. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '388 patent.

436. As a result of Google's infringement of the '388 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT XIII
INFRINGEMENT OF U.S. PATENT NO. 8,429,169

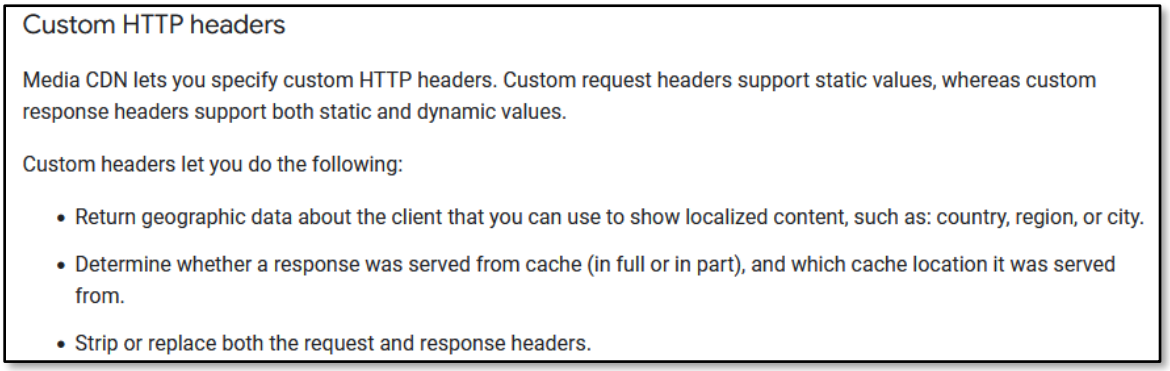
437. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

438. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for video cache indexing.

439. Google designs, makes, sells, offers to sell, imports, and/or uses the Google Content Delivery Network (CDN) including the Google Cloud Media CDN (the "Google '169 Product(s)").

440. One or more Google subsidiaries and/or affiliates use the Google '169 Products in regular business operations.

441. The Google '169 Products receive a request for content from a device connected to the Internet. Specifically, when a user makes a request to the Google '169 Products, an HTTP request is sent over the Internet. This HTTP request is received by the Google '169 Products, which are listening for incoming connections on the specific IP address and port number assigned (usually port 80 for HTTP and 443 for HTTPS). The request includes details such as the requested URL, HTTP method (e.g., GET, POST), headers, and any additional data.



Custom HTTP headers

Media CDN lets you specify custom HTTP headers. Custom request headers support static values, whereas custom response headers support both static and dynamic values.

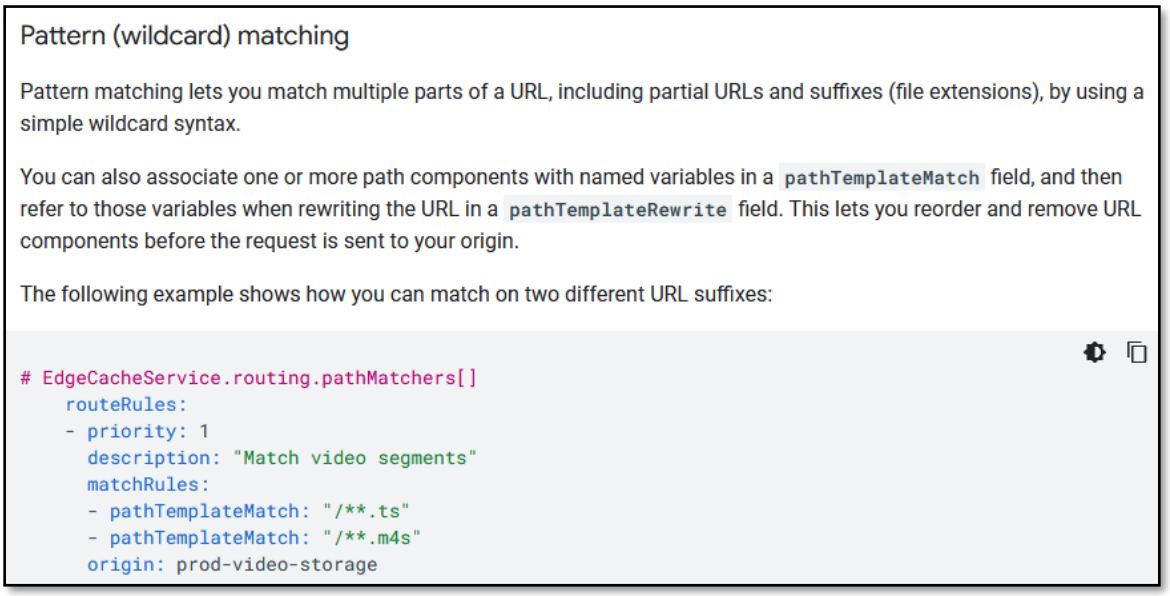
Custom headers let you do the following:

- Return geographic data about the client that you can use to show localized content, such as: country, region, or city.
- Determine whether a response was served from cache (in full or in part), and which cache location it was served from.
- Strip or replace both the request and response headers.

Google Media CDN Overview, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/media-cdn/docs/overview (last visited September 2023).

442. The Google '169 Products query a web server for a specific segment of content related to the user's content request. Once the Google '169 Products have received and parsed the request, the Google '169 Products determine how to handle the request based on its configuration rules. If the requested content is not available in the Google '169 Products' caches, the Google '169 Products may act as a reverse proxy and forward the request to the appropriate origin server. The web server processes this request and returns the requested content back to the Google '169 Products.

443. The Google '169 Products identify one or more descriptors for the content corresponding to the user's request, where these descriptors include the particular content segment associated with the initial request.



Pattern (wildcard) matching

Pattern matching lets you match multiple parts of a URL, including partial URLs and suffixes (file extensions), by using a simple wildcard syntax.

You can also associate one or more path components with named variables in a `pathTemplateMatch` field, and then refer to those variables when rewriting the URL in a `pathTemplateRewrite` field. This lets you reorder and remove URL components before the request is sent to your origin.

The following example shows how you can match on two different URL suffixes:

```
# EdgeCacheService.routing.pathMatchers[]
    routeRules:
    - priority: 1
      description: "Match video segments"
      matchRules:
      - pathTemplateMatch: "/**.ts"
      - pathTemplateMatch: "/**.m4s"
      origin: prod-video-storage
```

Google Media CDN – Configure Service Routes, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/media-cdn/docs/routing (last visited September 2023).

444. The Google '169 Products compute an index related to the requested content by applying the identified descriptors to a hashing function, wherein this computed index aids in locating a corresponding entry in a cache data structure by matching against indices tied to existing entries.

445. The Google '169 Products, acting as a reverse proxy, receive a request and processes it according to the rules defined in the Google '169 Products' configuration files. The Google '169 Products use the HTTP protocol to communicate with client devices and web servers. When a request is received, the Google '169 Products extract the request line, headers, and body from the request packet. The request line contains the request method (such as GET, POST, PUT, or DELETE), the request URL, and any query string or fragment identifier. The headers contain

metadata about the request, such as the client's IP address, browser type, and any authentication credentials. The body contains the data sent with the request, such as form data or file uploads.

446. The Google '169 Products then use the request line and headers to determine how to process the request. For example, if the request method is GET, the Google '169 Products will retrieve the requested content from a web server and return it to the client. If the request method is POST, the Google '169 Products will pass the request body to a web server for processing and return the server's response to the client. Characterization data includes data such as URL, Content-Type, ETag, Last-Modified date, etc. When the Google '169 Products receive content from the origin server, it also receives headers that contain this metadata. This metadata can be used to characterize the content for caching purposes.

447. When storing a response in the cache, the Google '169 Products generate a key using a hash function. The key can be modified using the proxy_cache_key directive. This key is used to store and retrieve the cached content efficiently.

448. Once the Google '169 Products have determined that it needs to retrieve content from a web server, the Google '169 Products send a request to the server using the HTTP protocol. The request includes the request line, headers, and any data from the client's request that needs to be passed to the server. The Google '169 Products can be configured to use different algorithms to choose the web server that will receive the request. For example, the Google '169 Products can use a round-robin algorithm to distribute requests across multiple servers, or the Google '169 Products can use a least-connections algorithm to send requests to the server with the fewest active connections.

449. Once the request is sent to the web server, the Google '169 Products wait for the server's response. The response includes a status line, headers, and a body containing the

requested content. The Google '169 Products then extract the content from the response body and store it in a cache.

450. The Google '169 Products process the content to identify characterization data that can be used to cache the content. The characterization data is a compact representation of the content that allows the Google '169 Products to quickly determine whether it has a cached copy of the content that is identical to the requested content. The Google '169 Products can use various algorithms to generate characterization data, such as a checksum, a hash function, or a compression algorithm. For example, a checksum can be used for small pieces of data, while a hash function can be used for larger pieces of data. The characterization data is then stored in the Google '169 Products cache, along with the content, so that it can be quickly retrieved when a subsequent request for the same content is received.

451. The Google '169 Products generate an index corresponding to content associated with the received content request by inputting the at least one identified characterization data into a hash function, wherein the generated index is used for identifying, in the cache data structure, an entry associated with the content by comparing the generated index to one or more index fields associated with one or more entries within the cache data structure.

452. The Google '169 Products use a hash function to generate an index that corresponds to the content. The hash function takes the characterization data as input and generates a unique output that can be used to identify the content in the Google '169 Products' cache. The hash function used by the Google '169 Products can be a simple hash function, such as the Jenkins hash function, or a more complex hash function, such as the SHA-256 hash function.

453. Google has directly infringed and continues to directly infringe the '169 patent by, among other things, making, using, offering for sale, and/or selling technology comprising video cache indexing, including but not limited to the Google '169 Products.

454. The Google '169 Products are available to businesses and individuals throughout the United States.

455. The Google '169 Products are provided to businesses and individuals located in this District.

456. By making, using, testing, offering for sale, and/or selling products and services comprising technology for video cache indexing, including but not limited to the Google '169 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '169 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

457. Google also indirectly infringes the '169 patent by actively inducing infringement under 35 U.S.C. § 271(b).

458. Google has had knowledge of the '169 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '169 patent and knew of its infringement, including by way of this lawsuit.

459. Google intended to induce patent infringement by third-party customers and users of the Google '169 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '169 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '169 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google

'169 Products that have the capability of operating in a manner that infringe one or more of the claims of the '169 patent, including at least claim 1, and Google further provides documentation and training materials that cause customers and end users of the Google '169 Products to utilize the products in a manner that directly infringe one or more claims of the '169 patent.[26] By providing instruction and training to customers and end-users on how to use the Google '169 Products in a manner that directly infringes one or more claims of the '169 patent, including at least claim 1, Google specifically intended to induce infringement of the '169 patent. Google engaged in such inducement to promote the sales of the Google '169 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '169 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '169 patent, knowing that such use constitutes infringement of the '169 patent.

460. The '169 patent is well-known within the industry as demonstrated by multiple citations to the '169 patent in published patents and patent applications assigned to technology

[26] *See e.g., Google Cloud Media CDN Configuration Guide*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/media-cdn/docs/configuration (last visited September 2023); *Google Cloud Media CDN Walkthrough*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (June 22, 2022); available at: https://www.youtube.com/watch?v=GF90l7uk1qE; *Configure Caching Behavior – Media CDN*, GOOGLE CLOUD DOCUMENTATION, available at: https://cloud.google.com/media-cdn/docs/caching (last visited September 2023); *Livin' on the (CDN) Edge (Cloud Next '19)*, GOOGLE CLOUD TECH YOUTUBE CHANNEL (April 11, 2019); available at: https://www.youtube.com/watch?v=JX2qrdp0WT4; *Live Streaming on Google Cloud with Media CDN and Live Streaming API*, GOOGLE CODE LABS DOCUMENTATION (December 13, 2022, available at: https://codelabs.developers.google.com/mediacdn-ls-codelab#0; *Media CDN with Google Ad Manager Integration*, GOOGLE CLOUD YOUTUBE CHANNEL (November 21, 2022), available at: https://www.youtube.com/watch?v=ETo6KufUWUM; and *Introducing Media CDN—the modern extensible platform for delivering immersive experiences*, GOOGLE CLOUD BLOG (April 25, 2022), available at: https://cloud.google.com/blog/products/networking/introducing-media-cdn.

companies and academic institutions. Google is utilizing the technology claimed in the '169 patent without paying a reasonable royalty. Google is infringing the '169 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

461. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '169 patent.

462. As a result of Google's infringement of the '169 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

COUNT XIV
INFRINGEMENT OF U.S. PATENT NO. 9,167,021

463. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

464. Google designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for HTTP transaction analysis for web browsing session segmentation.

465. Google designs, makes, sells, offers to sell, imports, and/or use the Google Search Console which includes LCP, CLS and FID reporting functionality (the "Google '021 Product(s)").

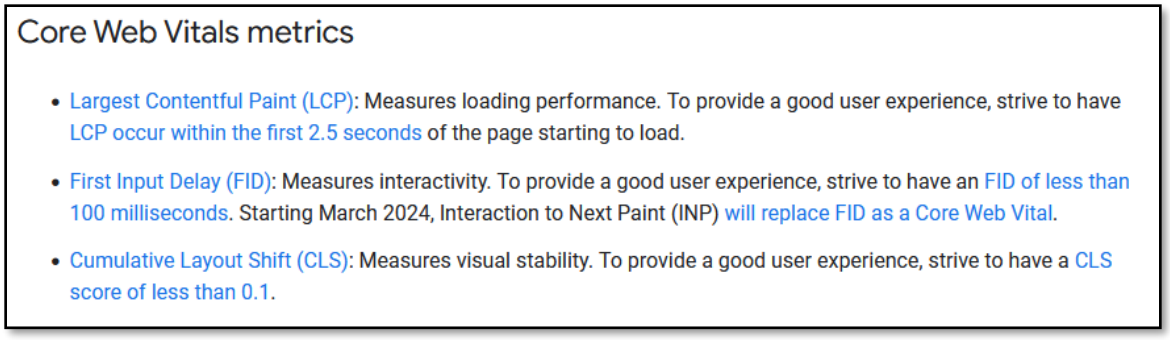
466. One or more Google subsidiaries and/or affiliates use the Google '021 Products in regular business operations.

467. The Google '021 Products capture an ongoing Hypertext Transfer Protocol (HTTP) interaction.

468. The Google '021 Products ascertain if the active HTTP interaction is associated with web browsing.

469. The Google '021 Products analyze the "User-Agent" string within HTTP headers to distinguish between various types of HTTP traffic. This includes differentiating between actual web browsers and, for example, API requests or bots.

470. The Google '021 Products retrieve a historical set of transactions for a designated client.

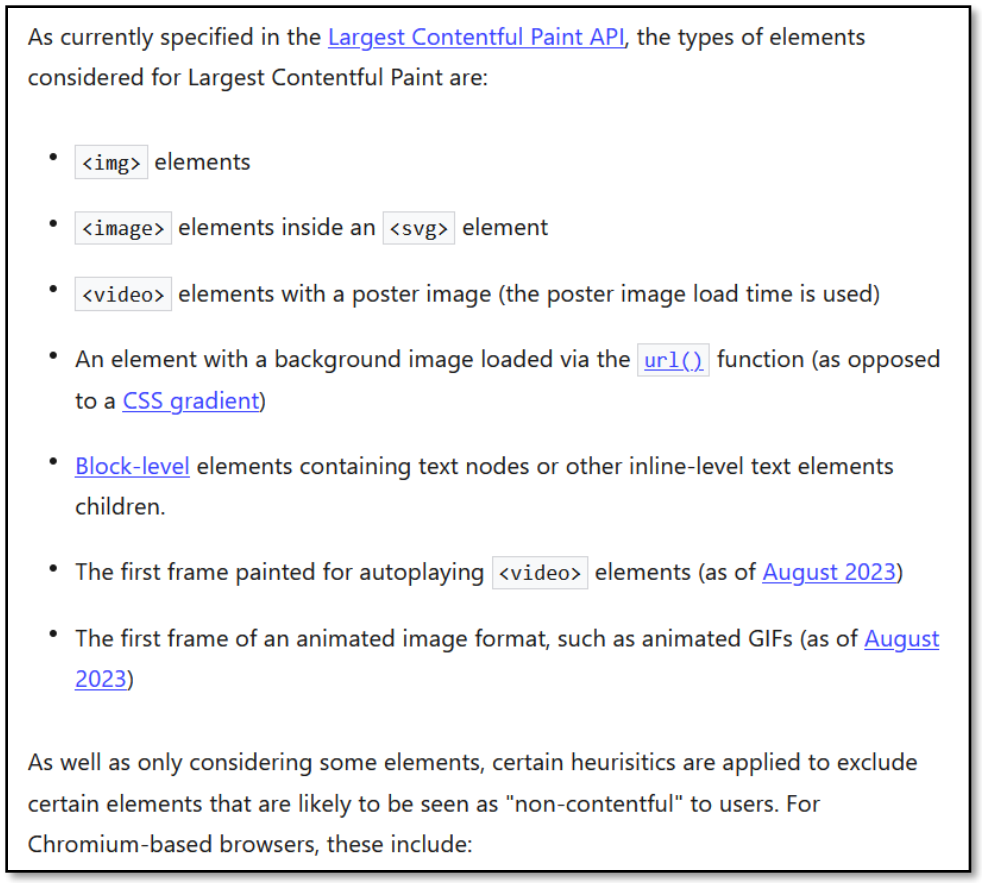

Core Web Vitals metrics

- Largest Contentful Paint (LCP): Measures loading performance. To provide a good user experience, strive to have LCP occur within the first 2.5 seconds of the page starting to load.
- First Input Delay (FID): Measures interactivity. To provide a good user experience, strive to have an FID of less than 100 milliseconds. Starting March 2024, Interaction to Next Paint (INP) will replace FID as a Core Web Vital.
- Cumulative Layout Shift (CLS): Measures visual stability. To provide a good user experience, strive to have a CLS score of less than 0.1.

Understanding Core Web Vitals and Google search results, GOOGLE SEARCH CENTRAL DOCUMENTATION, available at: https://developers.google.com/search/docs/appearance/core-web-vitals (last visited September 2023).

471. The Google '021 Products employ browser cookies, LocalStorage, and server-side session IDs to store and fetch a historical set of transactions specific to a client.

472. The Google '021 Products assess if the active HTTP interaction is related to the archived set of transactions for that client.



As currently specified in the Largest Contentful Paint API, the types of elements considered for Largest Contentful Paint are:

- `<img>` elements
- `<image>` elements inside an `<svg>` element
- `<video>` elements with a poster image (the poster image load time is used)
- An element with a background image loaded via the `url()` function (as opposed to a CSS gradient)
- Block-level elements containing text nodes or other inline-level text elements children.
- The first frame painted for autoplaying `<video>` elements (as of August 2023)
- The first frame of an animated image format, such as animated GIFs (as of August 2023)

As well as only considering some elements, certain heurisitics are applied to exclude certain elements that are likely to be seen as "non-contentful" to users. For Chromium-based browsers, these include:

Largest Contentful Paint, WEB.DEV WEBSITE (August 4, 2023), available at: https://web.dev/lcp/#what-is-a-good-lcp-score

473. The Google ‘021 Products employ sequence pattern recognition to understand whether a current HTTP transaction logically fits within a set of prior transactions.

474. The Google ‘021 Products, upon confirming the active HTTP interaction’s relation to the historical set, incorporate the current interaction into that set.

475. Upon determining that a transaction is related to the prior set, the Google ‘021 Products update their data structures to include the new transaction as a part of the existing set. This involves manipulating data objects that contain HTTP transactions as properties or list elements.

476. When the active HTTP interaction is deemed unrelated to the historical transaction set, the Google '021 Products delineate a page unit comprising the archived HTTP interactions for the purpose of calculating page unit time.

477. In cases where a transaction is evaluated as not belonging to the current set, a 'page boundary' is created by the Google '021 Products. This boundary serves as a cutoff for metrics calculations like average time spent on a page or session.

478. Google has directly infringed and continues to directly infringe the '021 patent by, among other things, making, using, offering for sale, and/or selling technology comprising HTTP transaction analysis for web browsing session segmentation, including but not limited to the Google '021 Products.

479. The Google '021 Products are available to businesses and individuals throughout the United States.

480. The Google '021 Products are provided to businesses and individuals located in this District.

481. By making, using, testing, offering for sale, and/or selling products and services comprising technology for HTTP transaction analysis for web browsing session segmentation, including but not limited to the Google '021 Products, Google has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '021 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

482. Google also indirectly infringes the '021 patent by actively inducing infringement under 35 U.S.C. § 271(b).

483. Google has had knowledge of the '021 patent since at least service of this Complaint or shortly thereafter, and Google knew of the '021 patent and knew of its infringement, including by way of this lawsuit.

484. Google intended to induce patent infringement by third-party customers and users of the Google '021 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Google specifically intended and was aware that the normal and customary use of the accused products would infringe the '021 patent. Google performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '021 patent and with the knowledge that the induced acts would constitute infringement. For example, Google provides the Google '021 Products that have the capability of operating in a manner that infringe one or more of the claims of the '021 patent, including at least claim 1, and Google further provides documentation and training materials that cause customers and end users of the Google '021 Products to utilize the products in a manner that directly infringe one or more claims of the '021 patent.[27] By providing instruction and training to customers and end-users on how to use the Google '021 Products in a manner that directly infringes one or more claims of the '021 patent, including at least claim 1, Google specifically intended to induce infringement of the '021 patent. Google

[27] *See e.g.*, *Google Search Console Core Vital Report*, GOOGLE SEARCH CONSOLE HELP, available at: https://support.google.com/webmasters/answer/9205520?hl=en (last visited September 2023); *Understanding Core Web Vitals and Google search results*, GOOGLE DEVELOPERS DOCUMENTATION, available at: https://developers.google.com/search/docs/appearance/core-web-vitals (last visited September 2023); *How to improve Cumulative Layout Shift for a better page experience*, GOOGLE SEARCH CENTRAL YOUTUBE CHANNEL (October 19, 2021); available at: https://www.youtube.com/watch?v=Z6WiGWDU0nU; *Introducing INP to Core Web Vitals*, GOOGLE SEARCH CENTRAL BLOG (May 10, 2023); available at: https://developers.google.com/search/blog/2023/05/introducing-inp; *Measure a web page's Core Web Vitals with the web-vitals library*, GOOGLE DEVELOPERS CODE LABS (May 2, 2022); available at: https://developers.google.com/codelabs/chrome-web-vitals-js; and *Optimize for interactivity using Web Vitals (FID/TBT)*, CHROME FOR DEVELOPERS YOUTUBE CHANNEL (December 16, 2020), available at: https://www.youtube.com/watch?v=WxYpdw5ELrU.

engaged in such inducement to promote the sales of the Google '021 Products, e.g., through Google user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '021 patent. Accordingly, Google has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '021 patent, knowing that such use constitutes infringement of the '021 patent.

485. The '021 patent is well-known within the industry as demonstrated by multiple citations to the '021 patent in published patents and patent applications assigned to technology companies and academic institutions. Google is utilizing the technology claimed in the '021 patent without paying a reasonable royalty. Google is infringing the '021 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

486. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '021 patent.

487. As a result of Google's infringement of the '021 patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Google's infringement, but in no event less than a reasonable royalty for the use made of the invention by Google together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff OptiMorphix, Inc. respectfully requests that this Court enter:

A. A judgment in favor of Plaintiff that Google has infringed, either literally and/or under the doctrine of equivalents, the '273, '418, '314, '871, '559, '167, '664, '285, '904, '105, '141, '388, '169, and '021 patents;

B. An award of damages resulting from Google's acts of infringement in accordance with 35 U.S.C. § 284;

C. A judgment and order finding that Google's infringement was willful, wanton, malicious, bad-faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate within the meaning of 35 U.S.C. § 284 and awarding to Plaintiff enhanced damages.

D. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to Plaintiff reasonable attorneys' fees against Google.

E. Any and all other relief to which Plaintiff may show themselves to be entitled.

JURY TRIAL DEMANDED

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, Plaintiff OptiMorphix, Inc. requests a trial by jury of any issues so triable by right.

Dated: September 27, 2023

BAYARD, P.A.

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