UNITED STATES DISTRICT COURT
DISTRICT OF DELAWARE

OPTIMORPHIX, INC., ***Plaintiff,*** v. **META PLATFORMS, INC.,** ***Defendant.***	**Civil Action No._____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

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"); 9,191,664 (the "'664 patent"); 8,621,061 (the "'061 Patent"); 7,987,285 (the "'285 Patent"); 8,230,105 (the "'105 Patent"); 8,769,141 (the "'141 Patent"); 10,412,388 (the "'388 Patent"); 9,894,361 (the "'361 Patent"); 10,123,015 (the "'015 Patent"); and 9,621,896 (the "'896 Patent") (collectively, the "Patents-in-Suit"). Defendant Meta Platforms, Inc. ("Meta" or "Defendant") infringes 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

1. 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.

2. 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.

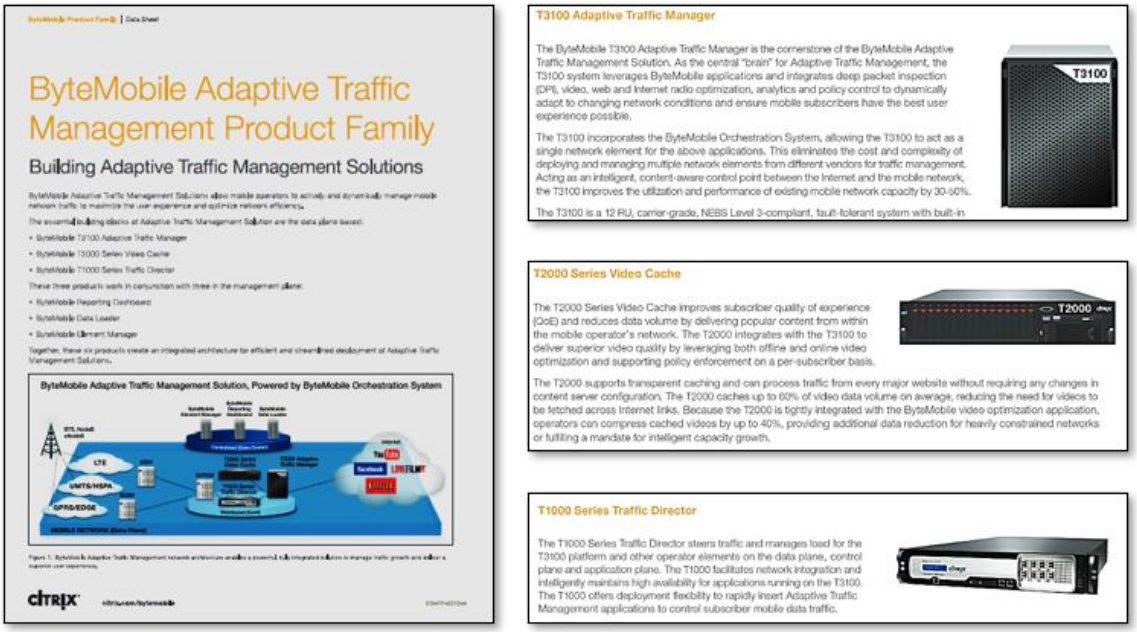
3. Bytemobile was established during a time when the mobile landscape was evolving rapidly. The advent of 3G technology, coupled with increasingly sophisticated smartphones, led to a surge in demand for data services. However, mobile networks at the time were not optimized to handle this influx, particularly 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 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.").

[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).

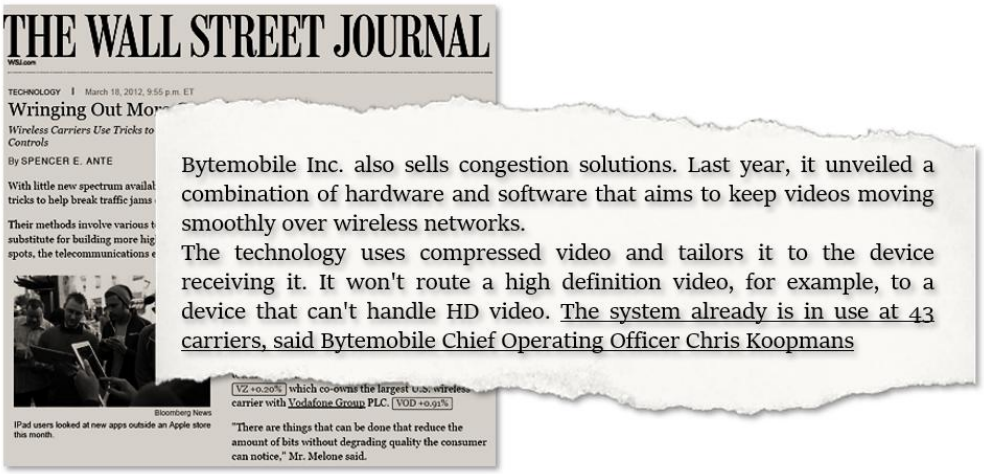
4. Bytemobile products, such as the Unison platform and the T3100 Adaptive Traffic Manager, were designed to optimize mobile data traffic in real-time, ensuring a high-quality mobile internet experience for end-users. This approach was groundbreaking at the time and set the stage for many of the mobile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

5. 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).

6. 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

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 availab... 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).

7. 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]

8. 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]

9. Defendant Meta Platforms, Inc. ("Meta"), is a Delaware corporation with its principal place of business at 1 Meta Way, Menlo Park, CA 94025. Meta may be served through its registered agent Corporation Service Company, 251 Little Falls Drive, Wilmington, Delaware 19808.

JURISDICTION AND VENUE

10. 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).

11. Venue is proper in this District under 28 U.S.C. §§ 1391(b)-(d) and 1400(b).

12. This Court has personal jurisdiction over Meta because it is organized under the laws of the State of Delaware and it maintains a registered agent in Delaware.

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[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.

THE ASSERTED PATENTS

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

13. U.S. Patent No. 7,099,273 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.

14. 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.

15. 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.

16. 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.

17. 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.

18. 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.

19. 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.

20. 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.

21. 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.

22. 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.

23. On March 8, 2024, Unified Patents, LLC filed a Request for *Ex Parte* Reexamination of the ‘273 Patent with the United States Patent and Trademark Office. The Patent Office entered an Order Granting *Ex Parte* Reexamination of the ‘273 Patent on April 29, 2024. On September 11, 2024, the Primary Examiner assigned to the Reexamination of the ‘273 Patent issued an Order confirming the patentability of all claims of the ‘273 Patent. On November 14, 2024, the United States Patent and Trademark Office issued *Ex Parte* Reexamination Certificate

No. 12770 confirming the patentability of Claims 1-15 of the '273 Patent. A true and correct copy of that Certificate is attached hereto as Exhibit 2.

24. 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. 9,191,664

25. U.S. Patent No. 9,191,664 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 3.

26. 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.

27. 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.

28. 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.

29. 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.

30. 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.

31. 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.

32. 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. 8,621,061

33. U.S. Patent No. 8,621,061 entitled, *Adaptive Bitrate Management for Streaming Media Over Packet Networks*, was filed on July 24, 2012. The '061 Patent claims priority to U.S. Provisional Application No. 60/948,917, which was filed July 10, 2007. A true and correct copy of the '061 Patent is attached hereto as Exhibit 4.

34. The '061 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 '061 Patent.

35. The ‘061 Patent is directed to the technological area of digital communications, specifically focusing on the transmission of digital information over packet networks.

36. The ‘061 Patent discloses methods and systems for managing the bitrate of streaming media over packet networks. One of embodiments disclosed by the ‘061 Patent teaches determining an optimal bitrate for streaming media data based on various factors such as network conditions, the type of media data, and the capabilities of the receiving device. The methods and systems then adjust the bitrate of the media data to the determined optimal bitrate.

37. The ‘061 Patent discloses a significant technological improvement to the existing technology of media streaming over packet networks. By managing the bitrate adaptively based on various factors and feedback from the receiving device, the invention allows for more efficient use of network resources and a better streaming experience for the user.

38. The ‘061 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 ‘061 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

39. U.S. Patent No. 7,987,285 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 5.

40. 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.

41. 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.

42. 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.

43. 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.

44. 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.

45. 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.

46. 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. 8,230,105

47. U.S. Patent No. 8,230,105 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 6.

48. 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.

49. 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.

50. 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.

51. 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.

52. 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.

53. 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.

54. 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.

55. 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

56. U.S. Patent No. 8,769,141 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 7.

57. 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.

58. 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.

59. 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.

60. 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.

61. 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

62. U.S. Patent No. 10,412,388 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 8.

63. 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.

64. 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.

65. 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.

66. 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.

67. 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.

68. 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. 9,894,361

69. U.S. Patent No. 9,894,361 entitled, *Framework for Quality-Aware Video Optimization*, was filed on March 31, 2010. The ‘361 Patent claims priority to U.S. Provisional Application No. 61/165,224, which was filed on March 31, 2009. The ‘361 Patent is subject to a 35 U.S.C. § 154(b) term extension of 1,038 days. A true and correct copy of the ‘361 Patent is attached hereto as Exhibit 9.

70. The ‘361 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 ‘361 Patent.

71. The ‘361 Patent relates to a method and system for quality-aware video optimization. Specifically, 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 further 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 is designed to reduce the byte size of the video stream as much as possible while limiting perceptual quality degradation to a controllable level.

72. The ‘361 Patent is directed to solving the problem of optimizing video quality in a way that balances the reduction of byte size with the preservation of perceptual quality. This involves a nuanced understanding of how quantization parameters (QPs) affect both the perceptual quality and the bitrate of a video frame, and how to manipulate these QPs to achieve the desired balance.

73. The ‘361 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 was only known after the frame was encoded. This made it challenging to achieve byte reduction and controllable quality degradation in a single pass.

74. The ‘361 Patent teaches the use of a quality-aware video optimization technique that requires only a single pass over the previously encoded video frame sequence to optimize the video frame sequence. It introduces a novel function that defines ΔQP according to the value of QPInput, allowing fine control of quality degradation in the byte-reduced content. It also considers differences between input and output compression formats (codecs) and computes codec adjustment that accounts for these differences.

75. The inventions disclosed in the '361 Patent provide significant benefits and improvements to the function of hardware in a computer network by enabling efficient video optimization. By allowing for single-pass, on-the-fly, quality-aware optimization, the patent's methods can be applied in various environments, including optimizing live video feeds before they traverse a low-capacity network segment, or optimizing surveillance video before archiving, thus saving storage space and network bandwidth.

76. The '361 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 '361 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. 10,123,015

77. U.S. Patent No. 10,123,015 entitled, *Macroblock-Level Adaptive Quantization in Quality-Aware Video Optimization*, was filed on April 10, 2017. The '015 Patent claims priority to U.S. Application No. 13/492,619, which was filed on June 8, 2012, and which issued as U.S. Patent No. 9,621,896. The '015 Patent claims priority to U.S. Provisional Application No. 61/495,951, which was filed on June 10, 2011. A true and correct copy of the '015 Patent is attached hereto as Exhibit 10.

78. The '015 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 '015 patent.

79. The ‘015 Patent teaches systems and methods for macroblock-level quality-aware video optimization. Unlike traditional methods that apply uniform compression settings across video frames, this approach focuses on adjusting compression at the macroblock level—small sections of a video frame. By analyzing each macroblock’s visual and compression characteristics, the system dynamically determines the appropriate quantization parameter (QP) to optimize the balance between file size and visual quality.

80. The technologies taught in the ‘015 Patent address the challenge of efficiently compressing video while preserving critical details, especially in regions with high visual complexity. Traditional methods fail to account for differences within a frame, leading to unnecessary quality degradation or inefficient compression. By tailoring QP settings to individual macroblocks, this system ensures better preservation of important visual elements, such as faces or text, while reducing the overall data size.

81. The ‘015 Patent provides significant benefits and improvements to the function of the hardware in a computer network by significantly reducing the necessary bitrate necessary to transmit video data with minimal perceptual quality loss. This is critical for computer networks to be able to deliver live-streamed video content and to deliver video content through low-bandwidth networks.

82. The ‘015 Patent has been cited by at least 29 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 ‘015 Patent family as relevant prior art:

- Microsoft Technology Licensing, LLC
- Google LLC
- Apple Inc.
- Samsung Electronics Co., Ltd.
- Qualcomm Incorporated
- Netflix, Inc.

- Sharp Corporation
- Tencent Technology (Shenzhen) Co., Ltd.
- Huawei Technologies Co., Ltd.
- Magnum Semiconductor, Inc.
- Integrated Device Technology, Inc.

U.S. PATENT NO. 9,621,896

83. U.S. Patent No. 9,621,896 entitled, *Macroblock-Level Adaptive Quantization in Quality-Aware Video Optimization*, was filed on June 8, 2012. The '896 Patent claims priority to U.S. Provisional Application No. 61/495,951, which was filed on June 10, 2011. A true and correct copy of the '896 Patent is attached hereto as Exhibit 11.

84. The '896 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 '896 Patent.

85. The '896 Patent relates to macroblock-level quality-aware video optimization, a method for improving video compression efficiency while maintaining perceptual quality. The '896 Patent discloses technologies for decoding video frames into small pixel blocks (macroblocks), analyzing visual and compression characteristics, and dynamically adjusting the quantization parameter (QP) for each block to optimize quality and file size.

86. The '896 Patent addresses the challenge of compressing video streams effectively without degrading user experience. Traditional methods apply uniform compression across entire frames, leading to unnecessary quality loss in detailed regions or excessive data usage in simpler regions. The technologies disclosed in the '896 Patent introduce precise control at the macroblock level, balancing file size reduction with quality retention.

87. One key benefit of the technologies disclosed in the '896 Patent that is important to the ubiquitousness of the distribution of video content over the internet and cellular networks is

the ability to improve important visual details while minimizing the bandwidth necessary to transmit the video data.

88. The ‘896 Patent has been cited by at least 29 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 ‘896 Patent family as relevant prior art:

- Microsoft Technology Licensing, LLC
- Apple Inc.
- Qualcomm Incorporated
- Netflix, Inc.
- Google LLC
- Sharp Kabushiki Kaisha
- Huawei Technologies Co., Ltd.
- Magnum Semiconductor, Inc.
- Tencent Technology (Shenzhen) Co., Ltd.
- Integrated Device Technology, Inc.

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

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

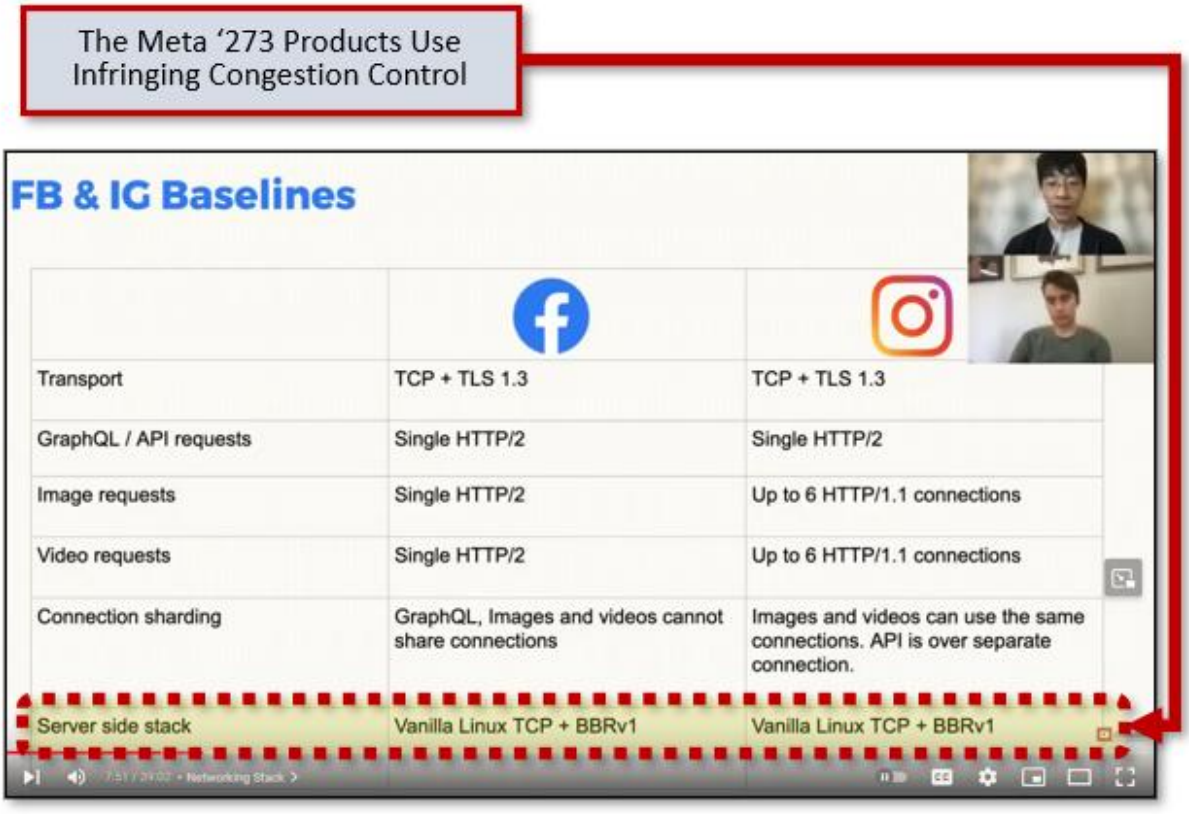
90. Meta designs, makes, uses, sells, and/or offers for sale in the United States products comprising systems and methods for data transport acceleration and management within a network communication system.

91. Meta designs, makes, sells, offers to sell, imports, and/or uses the Meta Platform, including but not limited to its internal data centers, content delivery networks, and all Meta products and services—such as Facebook, Instagram, WhatsApp, and Messenger—that implement TCP BBR as a congestion control algorithm to optimize data transmission (collectively, the “Meta ‘273 Product(s)”).

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

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

94. The Meta '273 Products utilize TCP BBR. Specifically, the Meta '273 Products, "On the server side, we just use standard Linux TCP stack. The congestion control we use is version one of BBR." Matt Joras and Yang Chi, *How Facebook Is Bringing QUIC to Billions*, META PLATFORMS PRESENTATION AT QCON CONFERENCE (March 14, 2022), *available at*: https://www.youtube.com/watch?v=tJBmuSmtxRg.



Matt Joras and Yang Chi, *How Facebook Is Bringing QUIC to Billions*, META PLATFORMS PRESENTATION AT QCON CONFERENCE (March 14, 2022), *available at*: https://www.youtube.com/watch?v=tJBmuSmtxRg (annotation added).

95. The Meta '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 Meta '273 Products are represented as "x." Upon receiving the SYN packet, the Meta '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.

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

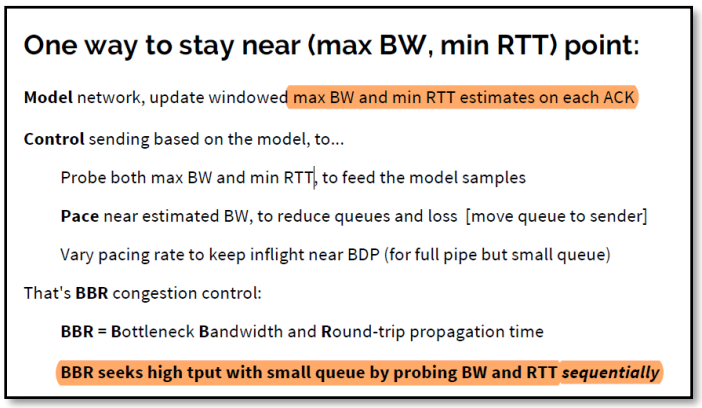
97. The Meta '273 Products measure round trip times (RTT) of packets sent between a client and server over a network. Specifically, the Meta '273 Products measure the round-trip propagation time (RTprop) using the minimum round-trip time (RTT) for the connection by keeping track of the lowest observed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

98. The Meta '273 Products perform timestamping. Specifically, when a Meta '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.

99. The Meta '273 Products perform acknowledgment processing. Specifically, the Meta '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 Meta '273 Products retrieve the original timestamp associated with that packet.

100. The Meta '273 Products perform a round-trip time (RTT) calculation. Specifically, the Meta '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.

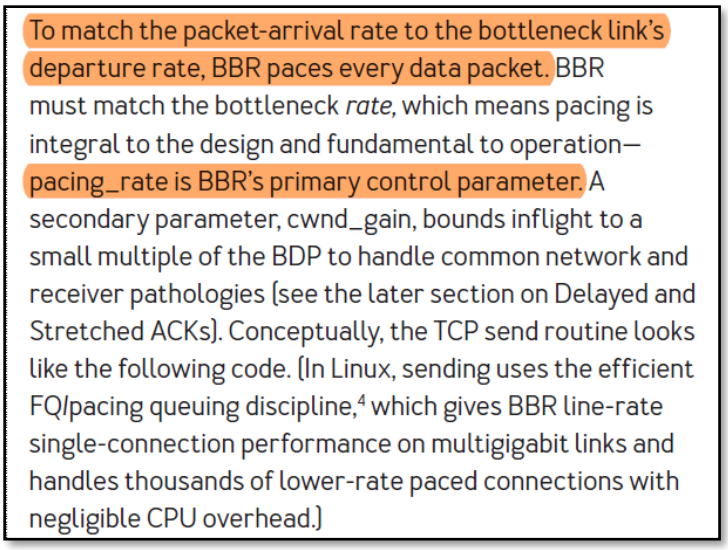


Neal Cardwell, Yunchung Cheng, et al,, *BBR Congestion Control*, GOOGLE IETF 97: SEOUL PRESENTATION at 9 (November 2016) (emphasis added) (describing RTT_sample = ACK_receive_time - original_timestamp).

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

102. The Meta '273 Products perform round-trip time-based pacing. Specifically, the Meta 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).

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

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

105. The Meta '273 Products calculate a congestion window. Specifically, the Meta '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 Meta '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.

106. The Meta '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.

107. The Meta '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.

108. Meta 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 Meta '273 Products.

109. The Meta '273 Products are available to businesses and individuals throughout the United States.

110. 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 Meta '273 Products, Meta 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).

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

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

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

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

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

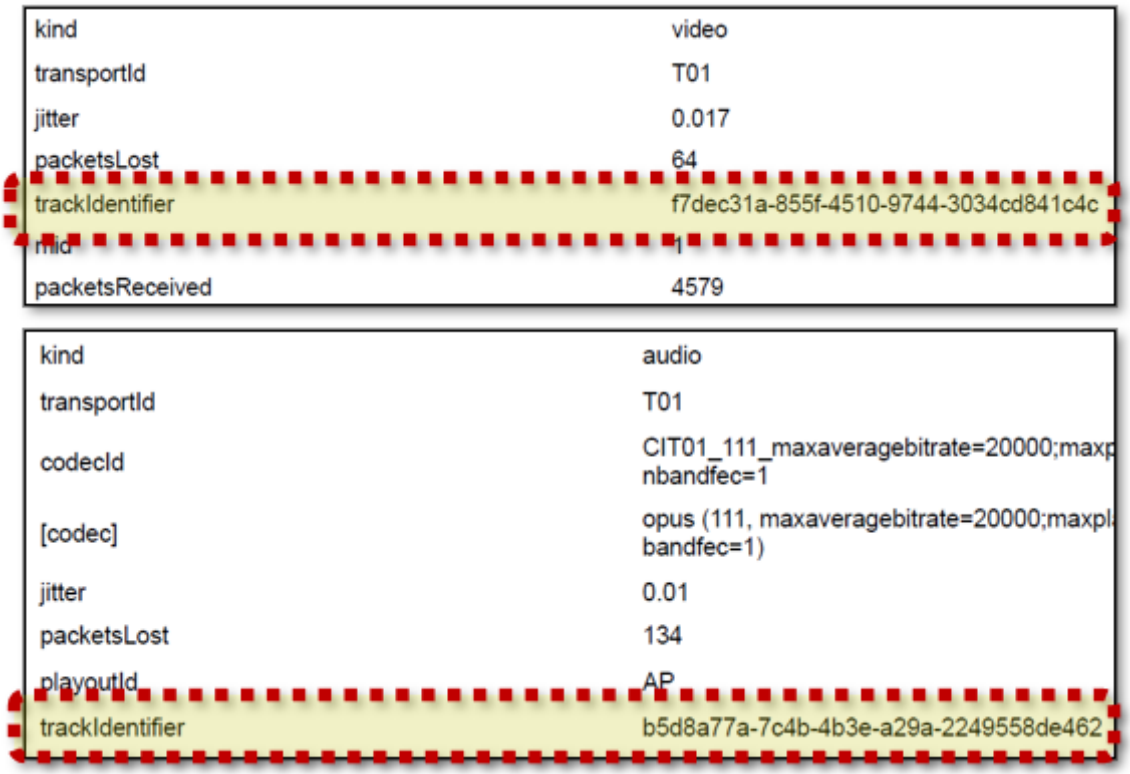
115. Meta designs, makes, sells, offers to sell, imports, and/or uses the following products: Facebook Messenger (Video Calls), Instagram (Video Calls), WhatsApp (Video Calls), Workplace by Meta (Video Calls), and Meta Horizon Workrooms (collectively, the "Meta '664 Product(s)").

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

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

118. The Meta '664 Products receive media data that includes audio media data and video media data. Specifically, the Meta '664 Products generate Session Description Protocol (SDP) records that show the Meta '664 Products use of specific codecs for both audio transmission (e.g., Opus codec at 48000Hz) and video transmission (e.g., H.264 codec). The Meta '664 Products use feedback parameters ("rtcp-fb") for both audio and video streams which show the Meta '664 Products receive and process audio and video data. In addition, the Meta '664 Products,

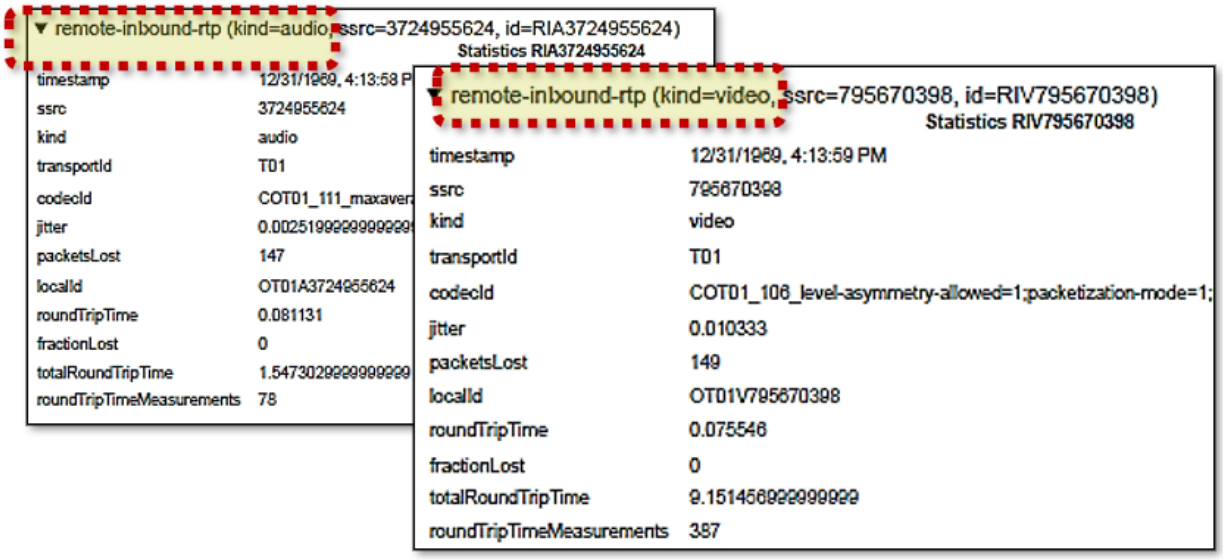
upon receiving video and media data, will create distinct audio and video tracks, each with unique identifiers and hardware associations. For example, the Meta '664 Products will generate a video track with an ID (e.g., "531d7605-997f-4f02-9e32-d82e7e874340") and an audio track with an ID (e.g., "86de80f5-e211-4e72-9cf5-de8eb766b226").



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

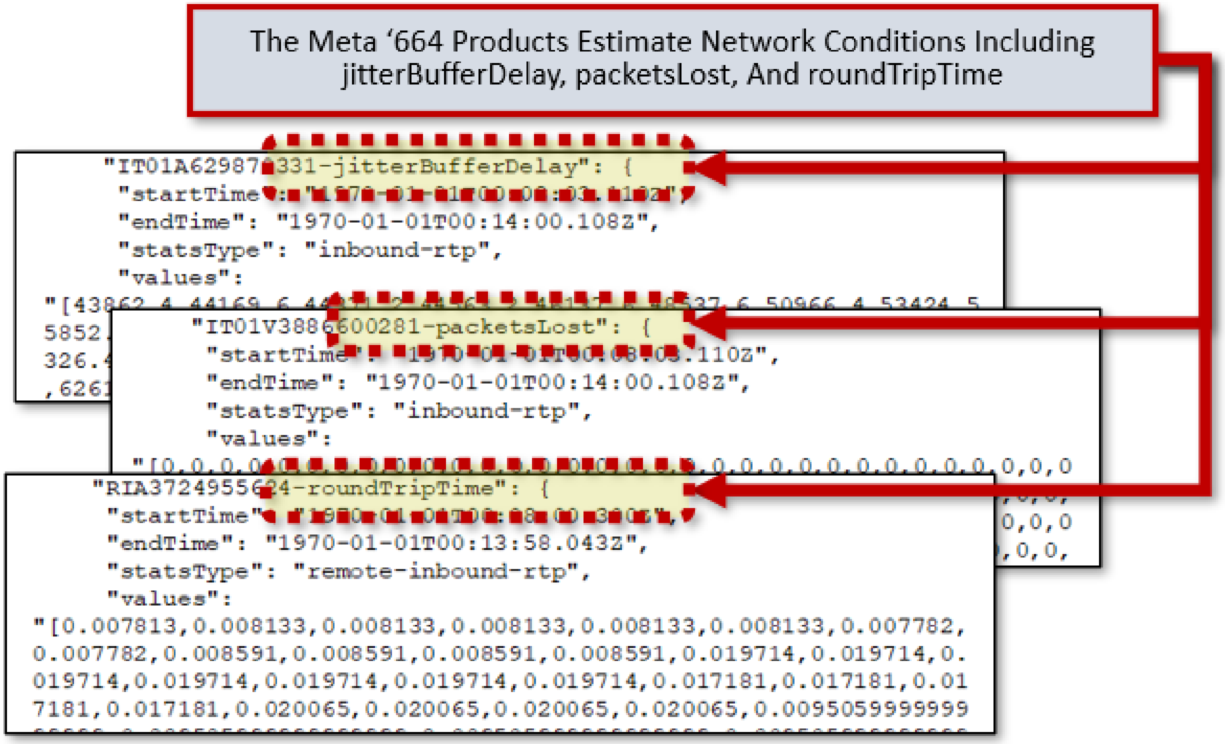
119. The Meta '664 Products receive feedback information from a terminal. Specifically, the Meta '664 Products receive feedback information from a terminal as demonstrated by the presence of remote-inbound RTP statistics and RTCP feedback mechanisms. For instance, the Meta '664 products identify "remote-inbound-rtp (kind=audio, ssrc=3724955624, id=RIA3724955624)." The Meta '664 Products collect data derived from feedback information, which contains feedback from the receiving endpoint about the quality of the received media stream. This feedback information includes metrics like packet loss, jitter, and

round-trip time, all provided by the remote terminal. In addition, the Meta '664 Products' documentation reference features like "a=rtcp-fb" (RTCP feedback) and support "transport-cc" which show the Meta '664 Products use feedback from the receiver. As an example, the presence of "a=rtcp-fb:111 transport-cc" in the Meta '664 Products shows the Meta '664 Products processes feedback information.



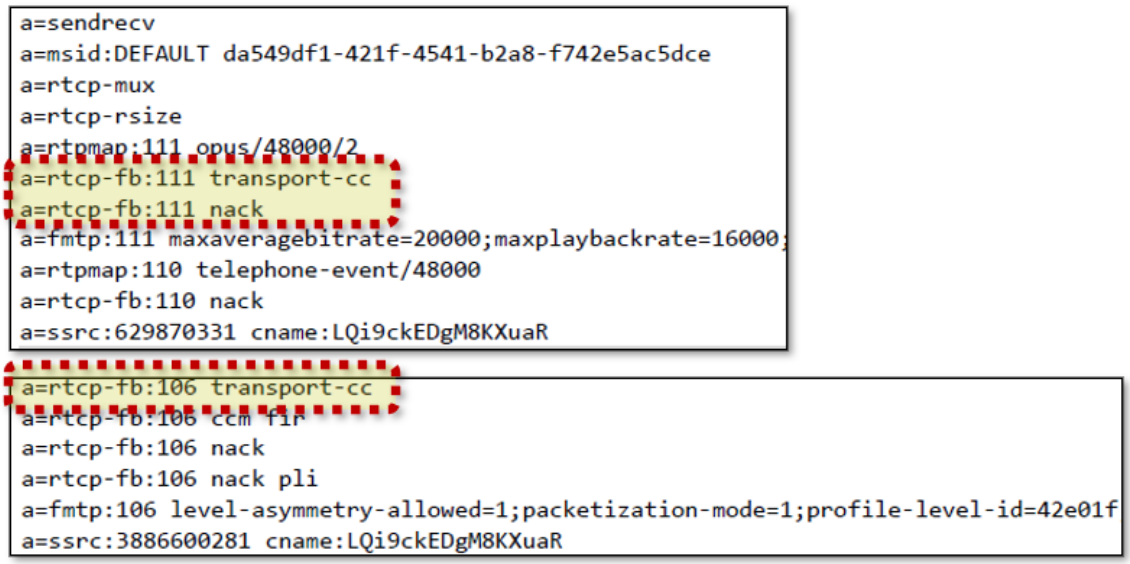
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

120. The Meta '664 Products estimate one or more network conditions of a media network using the feedback information. Specifically, the Meta '664 Products estimate network conditions using feedback information, as shown by the presence of feedback messages specifically designed for congestion control and bandwidth estimation. For example, the Meta '664 Products use "a=rtcp-fb:111 transport-cc." Transport-cc (transport-wide congestion control) relies on feedback from the receiver to adjust and optimize the sending bitrate based on current network quality indicators like packet loss, delay, and achievable throughput. This feedback data is used by the Meta '664 Products to measure network conditions.



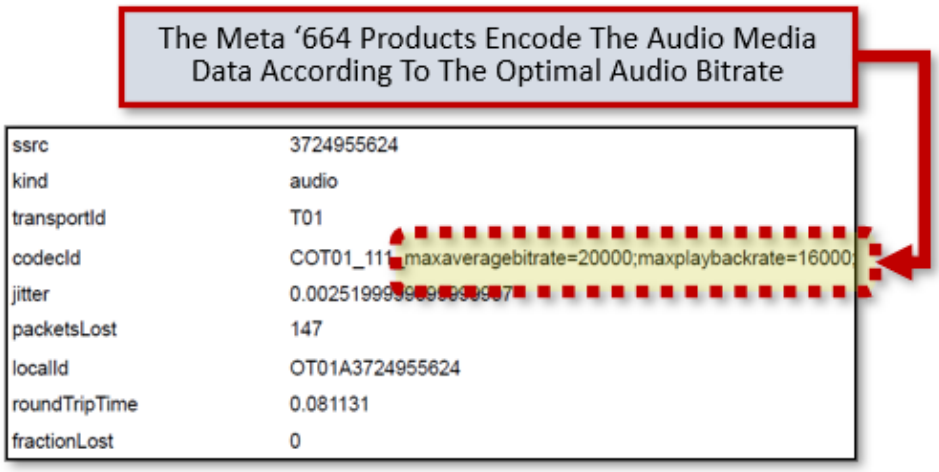
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

121. The Meta '664 Products determine an optimal audio bitrate and an optimal video bitrate using the estimated network conditions. Specifically, the Meta '664 Products use "transport-cc." The use of "Transport-CC" adjusts the sending bitrate based on current network capacity and stability. By continuously assessing delay, loss, and receiver-estimated bandwidth, the Meta '664 Products refine the outgoing bitrate to an optimal level. In addition, the Meta '664 Products use remote-inbound and remote-outbound statistics to receive and process network condition statistics from the receiver.



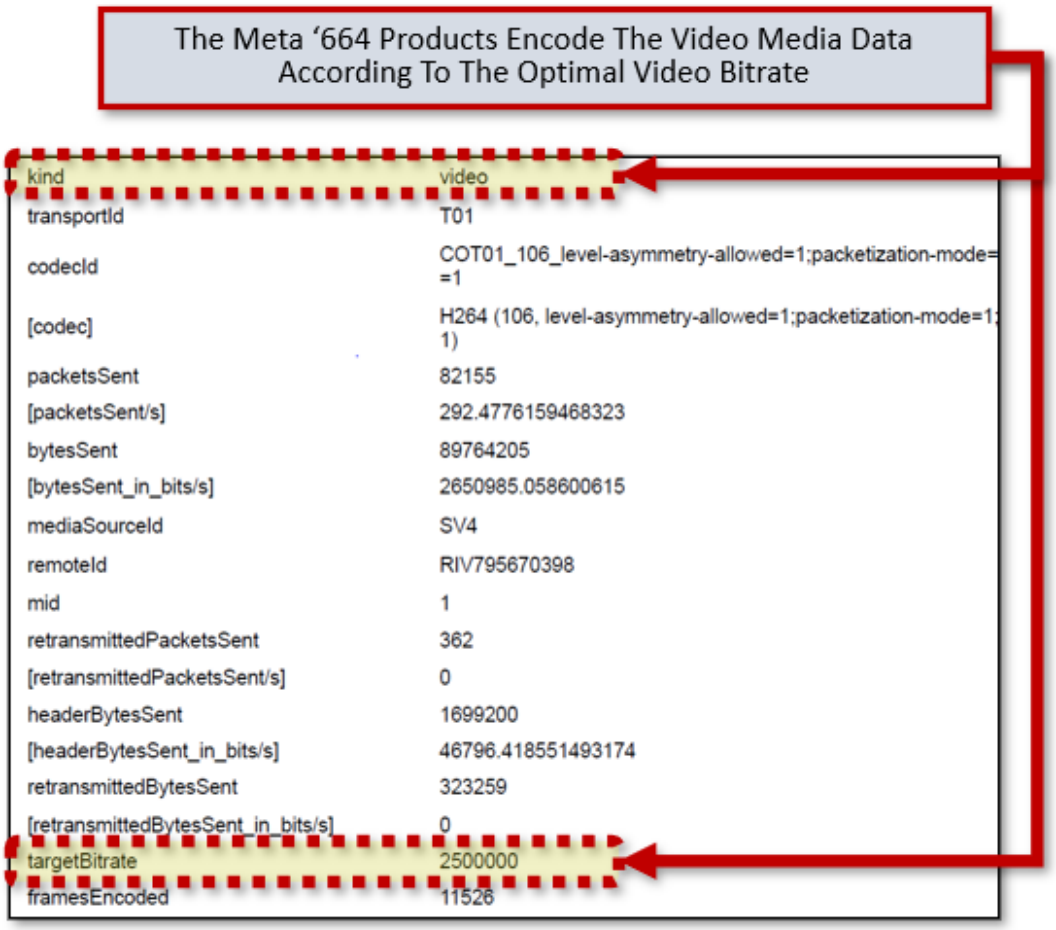
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

122. The Meta '664 Products encode the audio data using an optimal audio bitrate. Specifically, the Meta '664 Products utilize the Opus codec and session description protocol parameters to encoding audio data at an optimal bitrate. For example, the Meta '664 Products use codec parameters for audio such as "a=fmtp:111 maxaveragebitrate=20000; maxplaybackrate=16000; minptime=10; stereo=0; usedtx=1; useinbandfec=1." The Meta '664 Products enable setting an audio encoding parameter (e.g., maxaveragebitrate=20000) that ensures the Meta '664 Products' audio encoder does not exceed a certain average bitrate. The Meta '664 Products also use discontinuous transmission and forward error correction using the usedtx=1 and useinbandfec=1 parameters to encode audio data using an optimal audio bitrate.



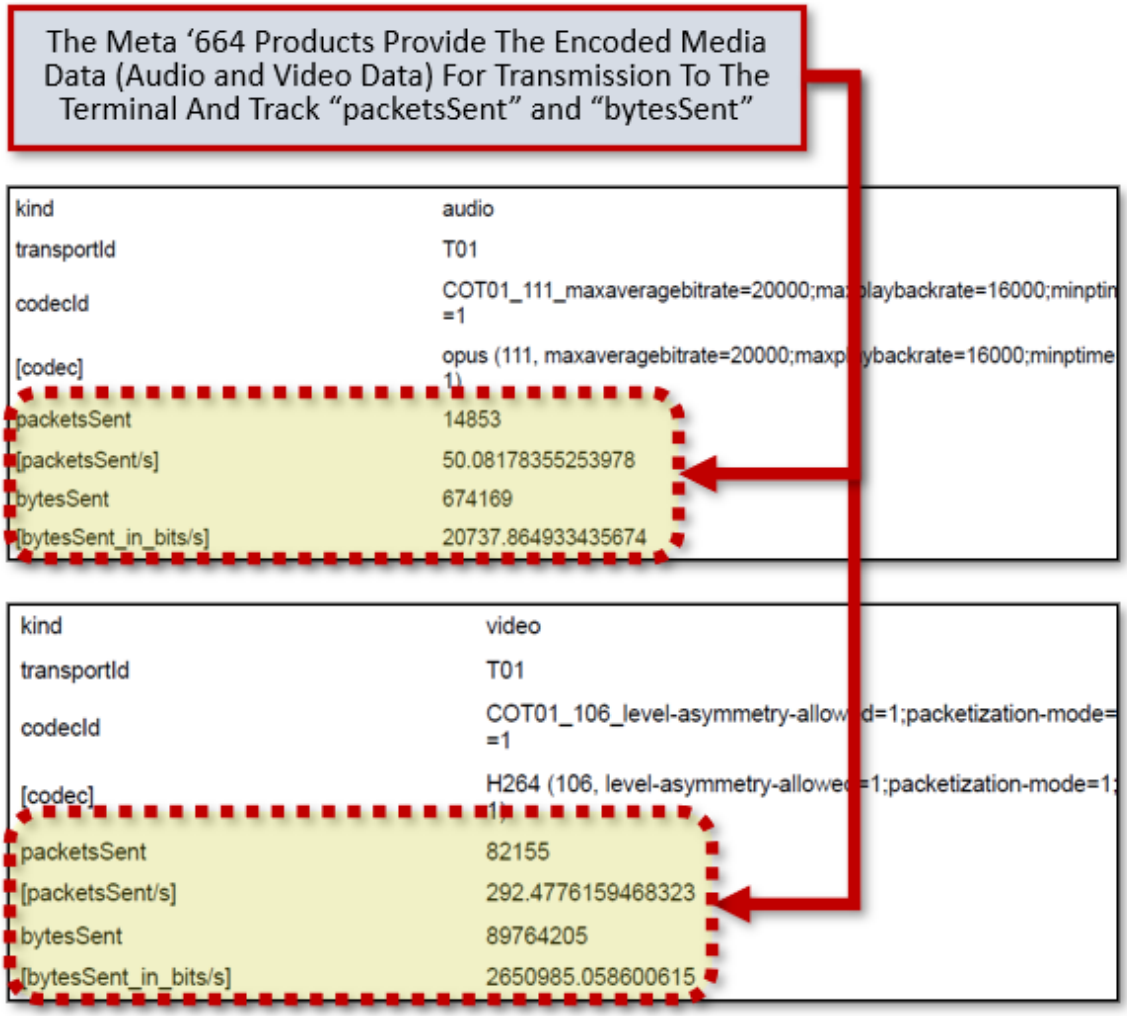
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

123. The Meta '664 Products encode the video data using an optimal video bitrate. Specifically, the Meta '664 Products set parameters including "encoderImplementation=OpenH264" and "targetBitrate=2500000," to select a specific video encoder and set a target bitrate based on network conditions. Additionally, the Meta '664 Products use feedback mechanisms (e.g., "a=rtcp-fb:106 transport-cc") to monitor bandwidth availability, packet loss, and latency that are then used to set the video encoding bitrate. Further, the Meta '664 Products use parameters such as "framesEncoded," "keyFramesEncoded," "totalEncodeTime," and "qpSum" to set and use an optimal video encoding bitrate. As bandwidth fluctuates, the Meta '664 Products will reduce the frame rate, lower the quantization parameter, and update the encoder's targetBitrate. When the network improves, the Meta '664 Products will increase the video encoding bitrate.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

124. The Meta '664 Products provide the encoded audio and video data for transmittal to a terminal. Specifically, the Meta '664 Products generate detailed ICE candidate information, such as *"a=candidate:4246889868 1 udp 41690367 157.240.22.48 54665 typ relay"*, which show the Meta '664 Products negotiate traversal paths through network address translation and firewalls to ensure the encoded data is transmitted. Once these network paths are established, the Meta '664 Products send out the encoded packets, as indicated by metrics such as *"packetsSent"* and *"bytesSent"*, reported in the candidate pair statistics. These metrics generated by the Meta '664 Products show the products are actively transmitting the encoded media data over networks.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

125. Meta 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 Meta '664 Products.

126. The Meta '664 Products are available to businesses and individuals throughout the United States.

127. The Meta '664 Products are provided to businesses and individuals located in this District.

128. 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 Meta '664 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '664 Patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

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

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

COUNT III
INFRINGEMENT OF U.S. PATENT NO. 8,621,061

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

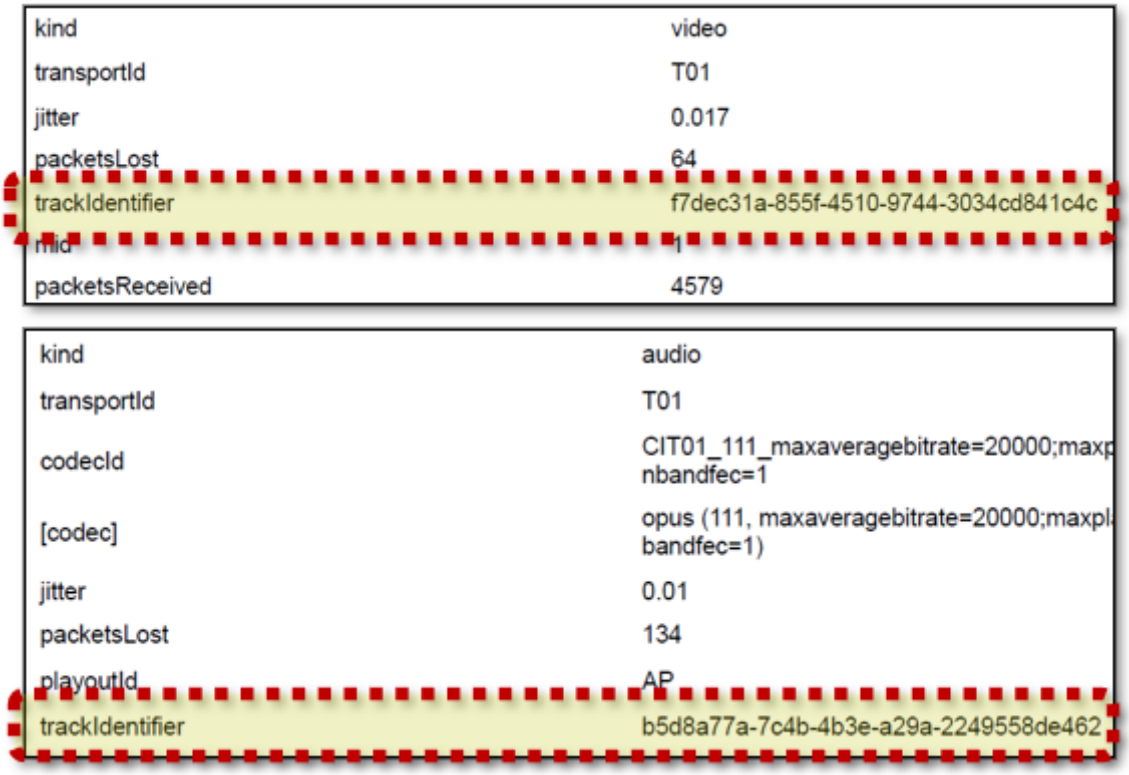
132. Meta designs, makes, uses, sells, and/or offers for sale in the United States products comprising the claimed adaptive bitrate management technology disclosed in the '061 Patent.

133. Meta designs, makes, sells, offers to sell, imports, and/or uses the following products: Facebook Messenger (Video Calls), Instagram (Video Calls), WhatsApp (Video Calls), Workplace by Meta (Video Calls), and Meta Horizon Workrooms (collectively, the "Meta '061 Product(s)").

134. One or more Meta subsidiaries and/or affiliates use the Meta '061 Products in regular business operations.

135. The Meta '061 Products ingest media content comprising both audio and video streams.

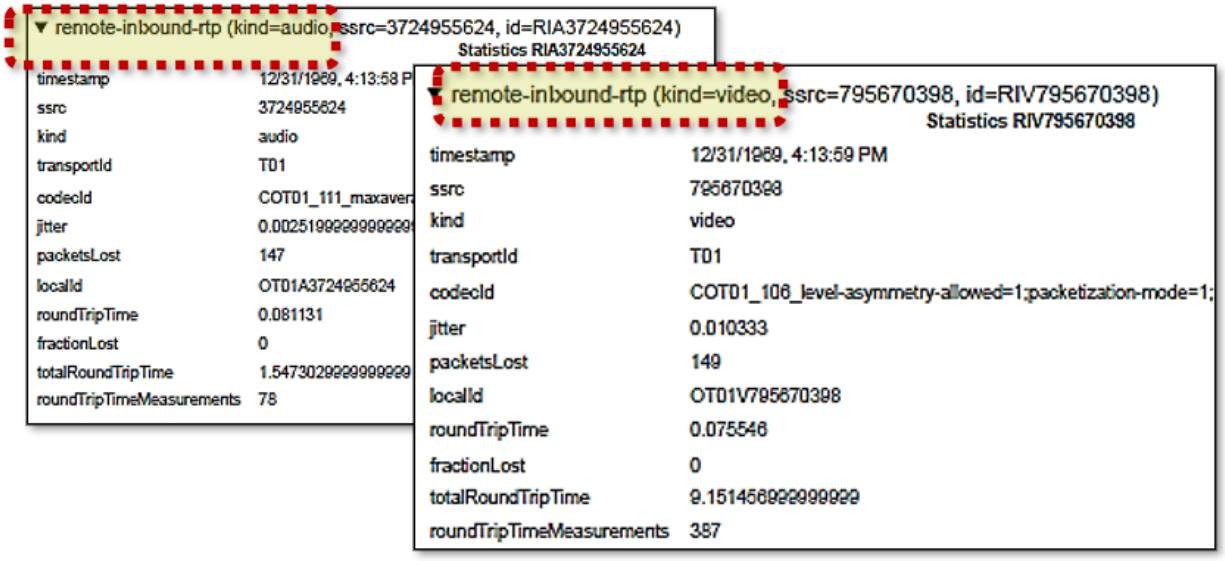
136. The Meta '061 Products receive media data that includes audio media data and video media data. Specifically, the Meta '061 Products generate Session Description Protocol (SDP) records that show the Meta '061 Products' use of specific codecs for both audio transmission (e.g., Opus codec at 48000Hz) and video transmission (e.g., H.264 codec). The Meta '061 Products use feedback parameters ("rtcp-fb") for both audio and video streams which show the Meta '061 Products receive and process audio and video data. In addition, the Meta '061 Products, upon receiving video and media data, will create distinct audio and video tracks, each with unique identifiers and hardware associations. For example, the Meta '061 Products will generate a video track with an ID (e.g., "531d7605-997f-4f02-9e32-d82e7e874340") and an audio track with an ID (e.g., "86de80f5-e211-4e72-9cf5-de8eb766b226").



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

137. The Meta '061 Products receive a receiver report from a terminal. Specifically, the Meta '061 Products receive receiver reports from the terminal as demonstrated by the presence of

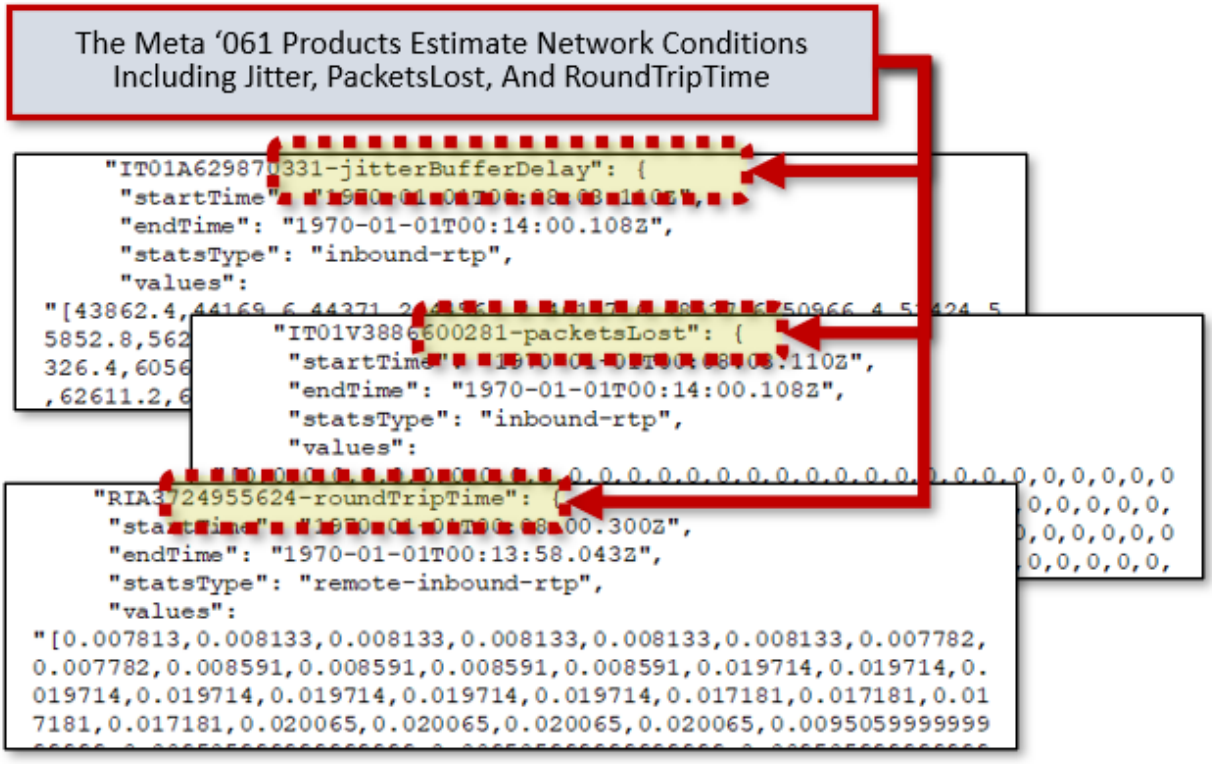
remote-inbound RTP statistics and RTCP feedback mechanisms. For instance, the Meta '061 products identify "remote-inbound-rtp (kind=audio, ssrc=3724955624, id=RIA3724955624)." The Meta '061 Products collect data derived from RTCP Receiver Reports, which contain feedback from the receiving endpoint about the quality of the received media stream. These receiver reports include metrics like packet loss, jitter, and round-trip time, all provided by the remote terminal. In addition, the Meta '061 Products' documentation reference features like "a=rtcp-fb" (RTCP feedback) and support "transport-cc," which show the Meta '061 Products use feedback from the receiver. As an example, the presence of "a=rtcp-fb:111 transport-cc" in the Meta '061 Products shows the Meta '061 Products process receiver-generated metrics.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

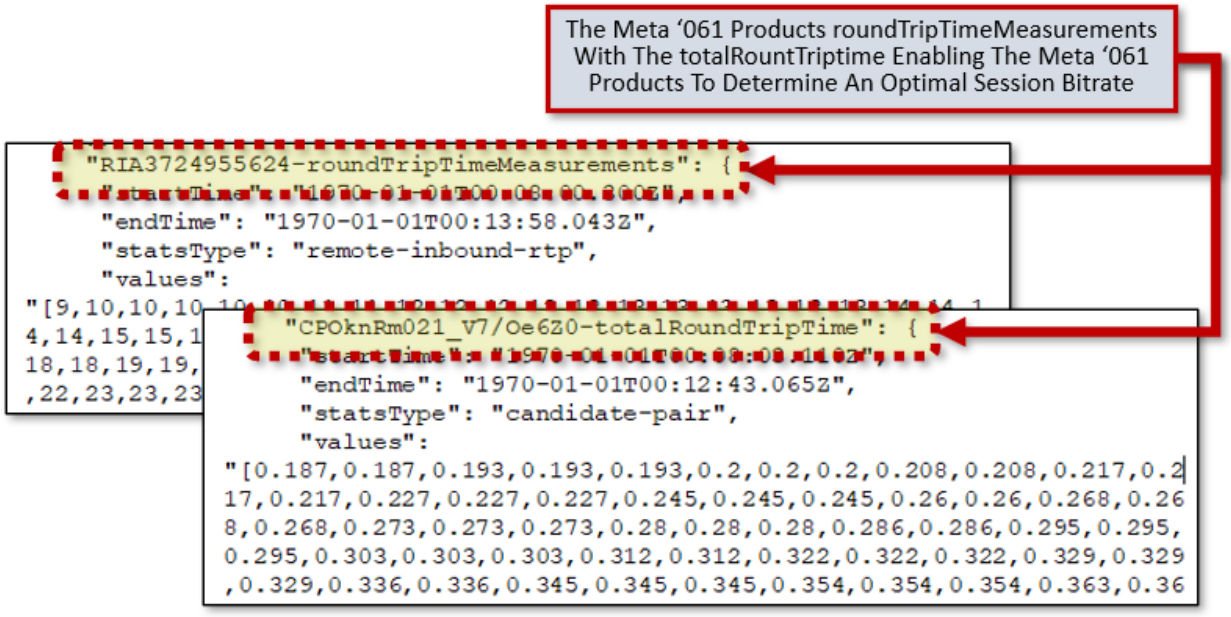
138. The Meta '061 Products estimate at least one network condition using the receiver report. Specifically, the Meta '061 Products utilize "transport-cc" (Transport-Wide Congestion Control) which provides detailed round-trip time measurements and arrival patterns of packets, enabling the Meta '061 Products to fine-tune its sending rates based on real-time network performance. In addition, the Meta '061 Products track metrics such as jitterBufferDelay,

roundTripTime, packetsLost, and fractionLost. This data is derived from receiver reports and indicate the network conditions. The Meta '061 Products, by computing round-trip times and packet loss fractions from these reports, track network congestion levels, jitter, and latency.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

139. The Meta '061 Products determine an optimal session bitrate using the estimated network conditions. Specifically, the Meta '061 Products use the network conditions from receiver reports to determine an optimal session bitrate, as shown in the use of "transport-cc." The use of "transport-cc" adjusts the sending bitrate based on current network capacity and stability. By continuously assessing delay, loss, and receiver-estimated bandwidth, the Meta '061 Products derive the optimal bitrate. In addition, the Meta '061 Products use remote-inbound and remote-outbound statistics to receive and process network condition statistics from the receiver.

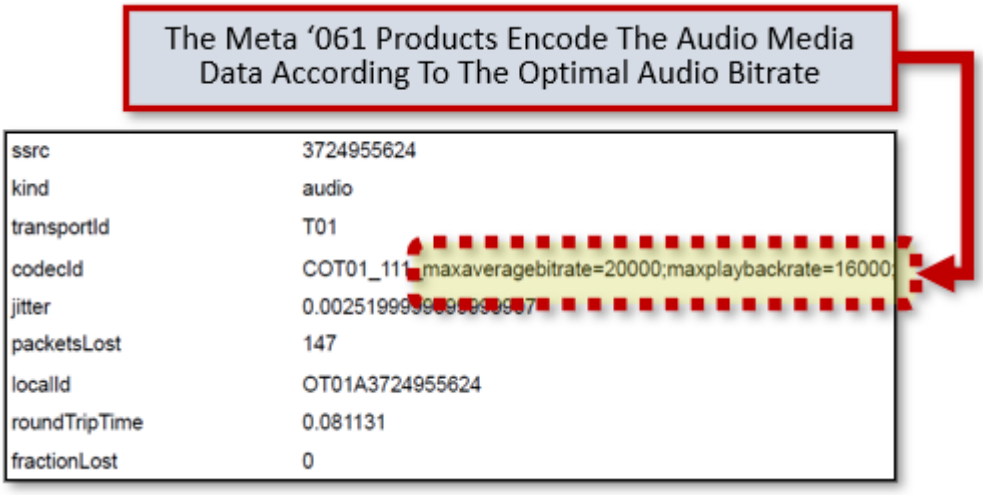


FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

140. The Meta '061 Products allocate the optimal session bitrate between audio data and video data. Specifically, the Meta '061 Products contain feedback loops that assess network conditions (e.g., "a=rtcp-fb:111 transport-cc"), the Meta '061 Products adjust the overall session bitrate and distribute that bitrate optimally between its audio and video components. For instance, the session description protocol parameters for audio, such as `a=fmtp:111 maxaveragebitrate=20000;maxplaybackrate=16000;...`, used by the Meta '061 Products enable a controlled, maximum average bitrate for the audio channel. Simultaneously, the Meta '061 Products track video performance indicators ("outbound-rtp") including `targetBitrate,` `framesEncoded,` and `totalEncodeTime.` In addition, the Meta '061 Products track session conditions for audio and video data—including "inbound-rtp" and "outbound-rtp" stats for audio and video. The Meta '061 Products use parameters like `qpSum` (quantization parameter sum) for video and `concealedSamples` for audio, to determine bandwidth should be more heavily invested. High latency or packet loss indicated by receiver reports will cause the Meta '061

Product to reduce video bitrate while maintaining higher audio quality to ensure intelligibility. In other conditions, when bandwidth is plentiful, the Meta '061 Products will allocate more bitrate to video to improve resolution and frame rate.

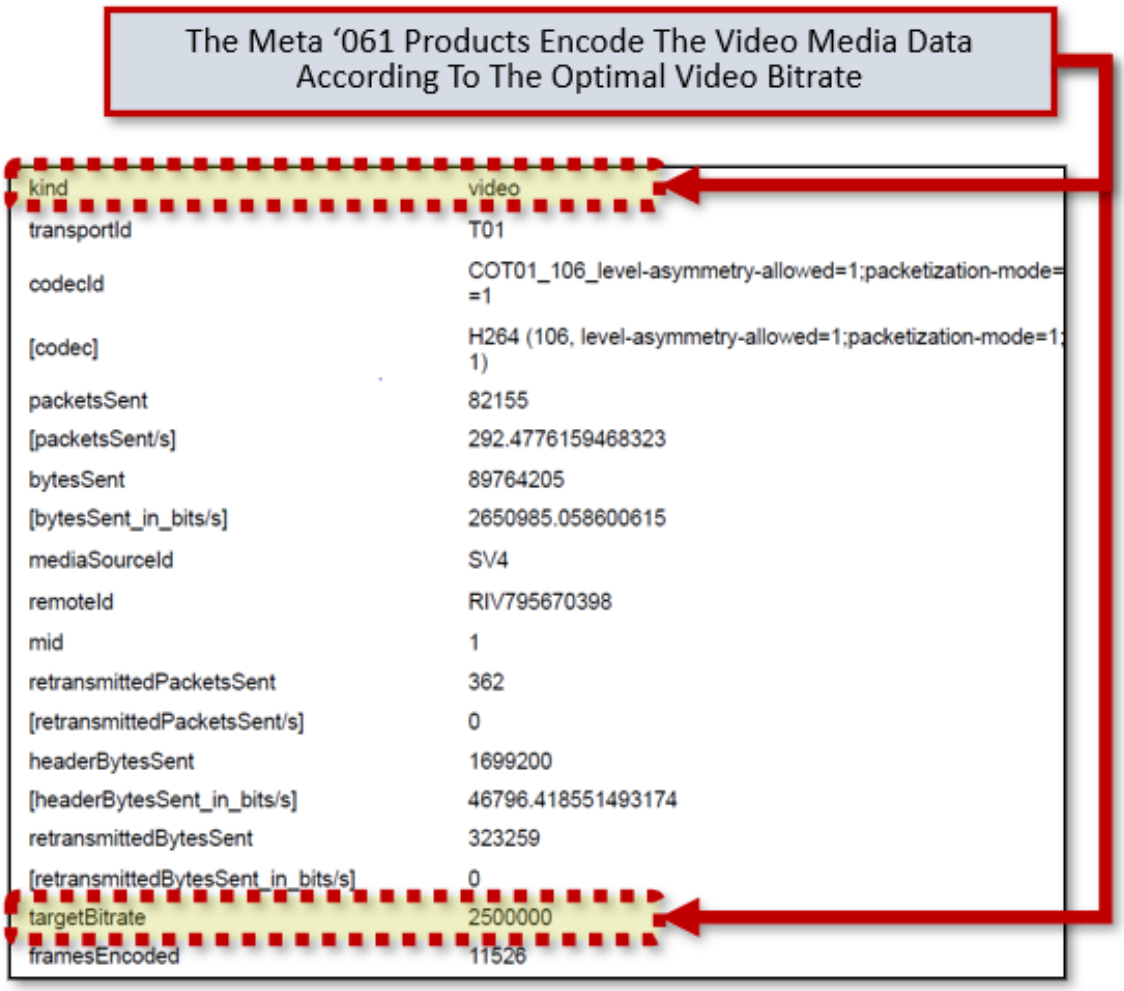
141. The Meta '061 Products encode the audio data using an optimal audio bitrate. Specifically, the Meta '061 Products utilize the Opus codec and session description protocol parameters to encode audio data at an optimal bitrate. For example, the Meta '061 Products use codec parameters for audio such as "a=fmtp:111 maxaveragebitrate=20000; maxplaybackrate=16000; minptime=10; stereo=0; usedtx=1; useinbandfec=1." The Meta '061 Products enable setting an audio encoding parameter (e.g., maxaveragebitrate=20000) that ensures the Meta '061 Products ensure that the audio encoder does not exceed a certain average bitrate. The Meta '061 Products also use discontinuous transmission and forward error correction using the usedtx=1 and useinbandfec=1 parameters to encode audio data using an optimal audio bitrate.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

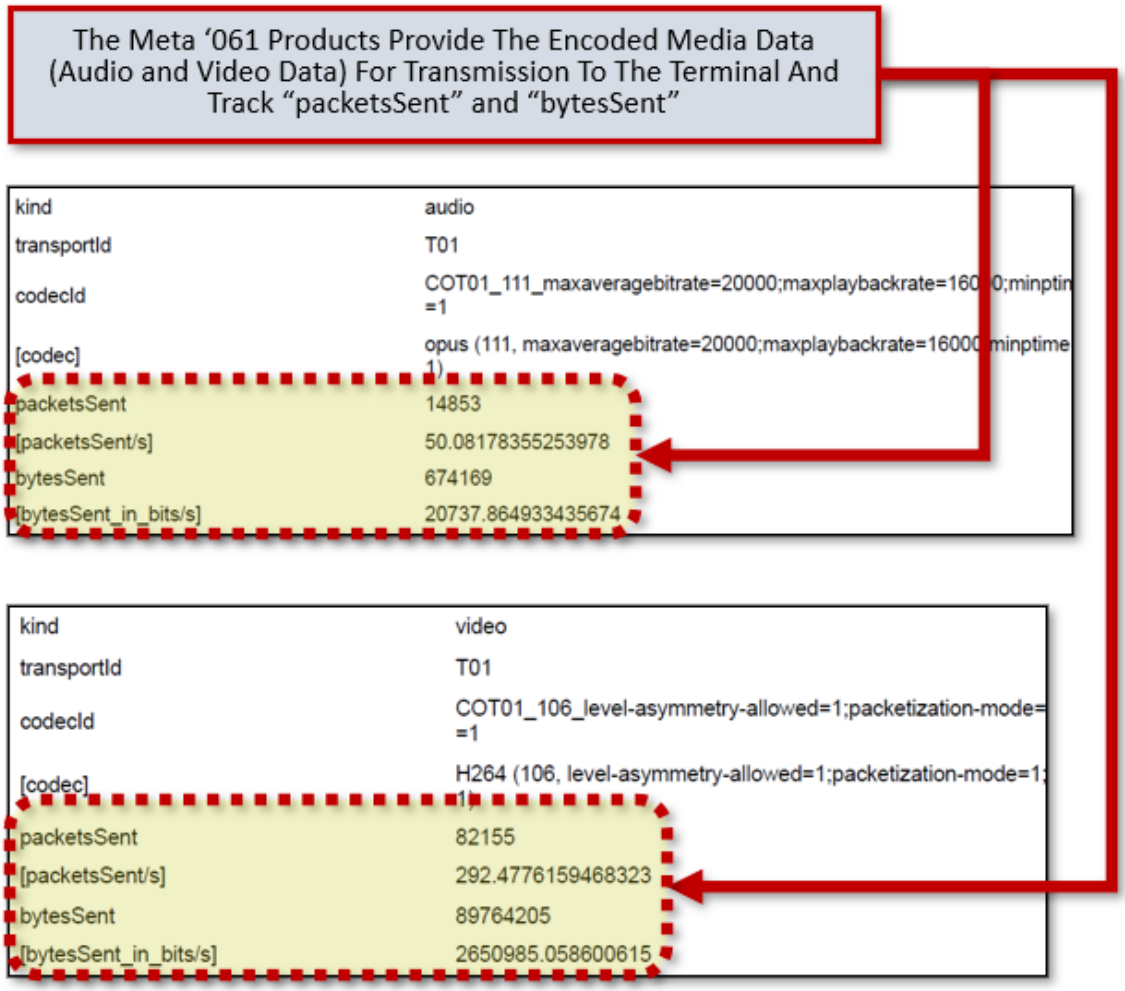
142. The Meta '061 Products encode the video data using an optimal video bitrate. Specifically, the Meta '061 Products set parameters including "encoderImplementation=OpenH264" and "targetBitrate=2500000" to select a specific video

encoder and set a target bitrate based on network conditions. Additionally, the Meta '061 Products use feedback mechanisms (e.g., "a=rtcp-fb:106 transport-cc") to monitor bandwidth availability, packet loss, and latency that are then used to set the video encoding bitrate. Further, the Meta '061 Products use parameters such as "framesEncoded," "keyFramesEncoded," "totalEncodeTime," and "qpSum" to set and use an optimal video encoding bitrate. As bandwidth fluctuates, the Meta '061 Products will reduce the frame rate, lower the quantization parameter, and update the encoder's targetBitrate. When the network improves, the Meta '061 Products will increase the video encoding bitrate.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

143. The Meta ‘061 Products provide the encoded audio and video data for transmission to the terminal. Specifically, the Meta ‘061 Products record “outbound-rtp” statistics as part of the process of transmitting the encoded audio and video including `packetsSent` and `bytesSent.`



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

144. Meta has directly infringed and continues to directly infringe the ‘061 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 Meta ‘061 Products.

145. The Meta ‘061 Products are available to businesses and individuals throughout the United States.

146. The Meta ‘061 Products are provided to businesses and individuals located in this District.

147. 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 Meta ‘061 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the ‘061 Patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

148. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘061 Patent.

149. As a result of Meta’s infringement of the ‘061 Patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Meta’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Meta together with interest and costs as fixed by the Court.

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

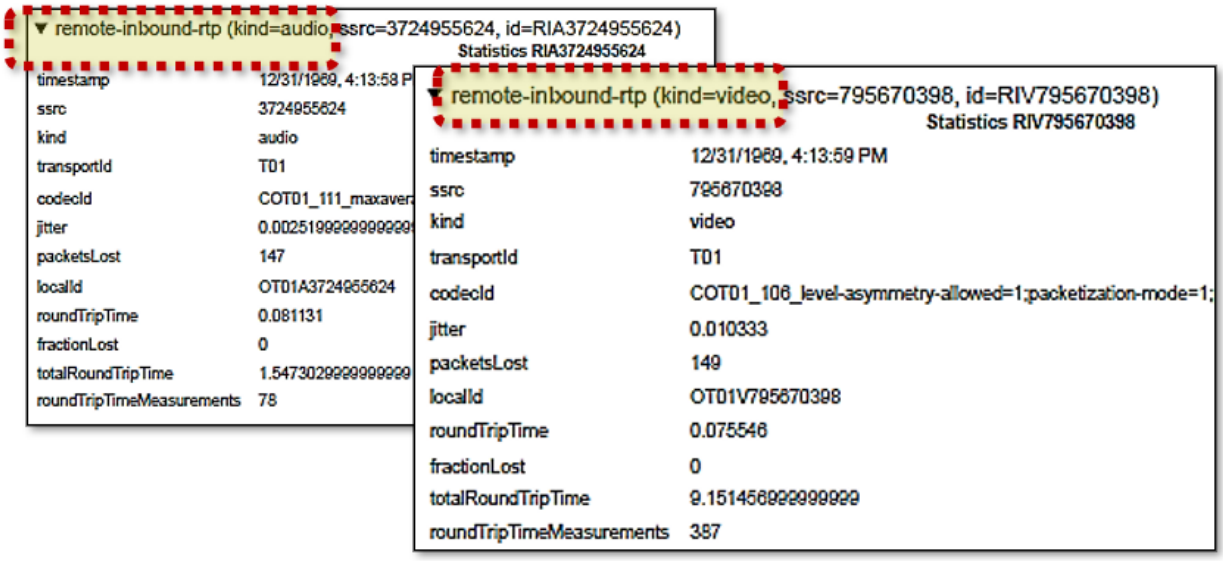
150. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

151. Meta 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.

152. Meta designs, makes, sells, offers to sell, imports, and/or uses the following products: Facebook Messenger (Video Calls), Instagram (Video Calls), WhatsApp (Video Calls), Workplace by Meta (Video Calls), and Meta Horizon Workrooms (collectively, the “Meta ‘285 Product(s)”).

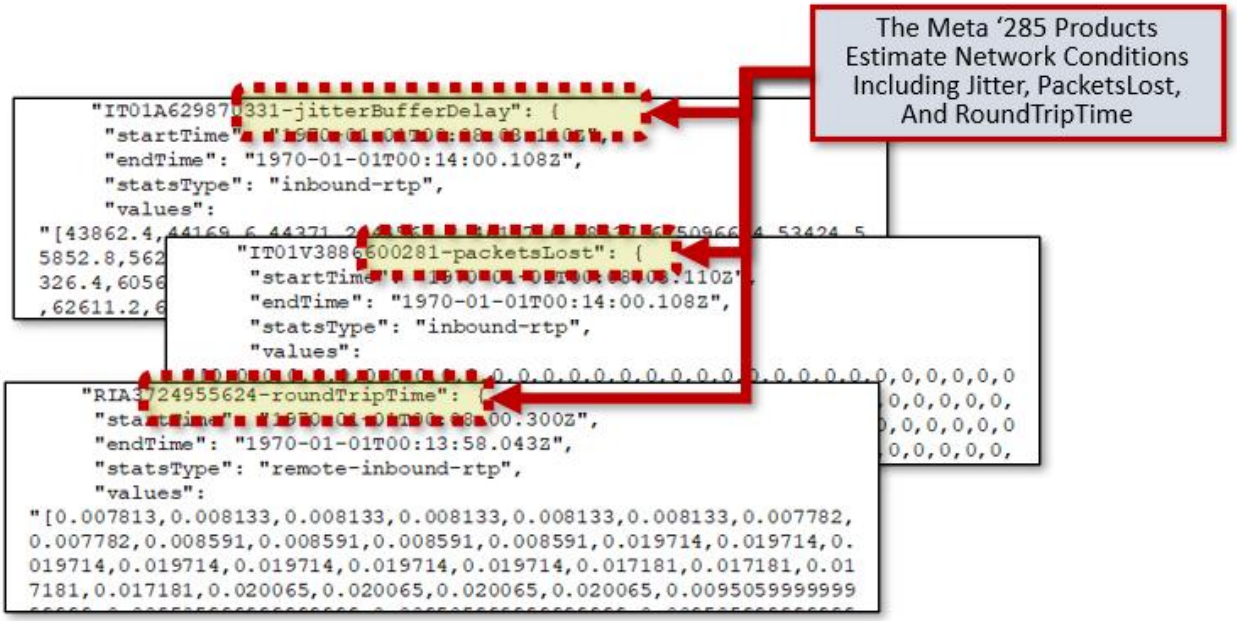
153. One or more Meta subsidiaries and/or affiliates use the Meta '285 Products in regular business operations.

154. The Meta '285 Products receive a receiver report from a terminal. Specifically, the Meta '285 Products receive receiver reports from the terminal as demonstrated by the presence of remote-inbound RTP statistics and RTCP feedback mechanisms. For instance, the Meta '285 products identify "remote-inbound-rtp (kind=audio, ssrc=3724955624, id=RIA3724955624)." The Meta '285 Products collect data derived from RTCP Receiver Reports, which contain feedback from the receiving endpoint about the quality of the received media stream. These receiver reports include metrics like packet loss, jitter, and round-trip time, all provided by the remote terminal. In addition, the Meta '285 Products' documentation reference features like "a=rtcp-fb" (RTCP feedback) and support "transport-cc," which show the Meta '285 Products use feedback from the receiver. As an example, the presence of "a=rtcp-fb:111 transport-cc" in the Meta '285 Products shows the Meta '285 Products processes receiver-generated metrics.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

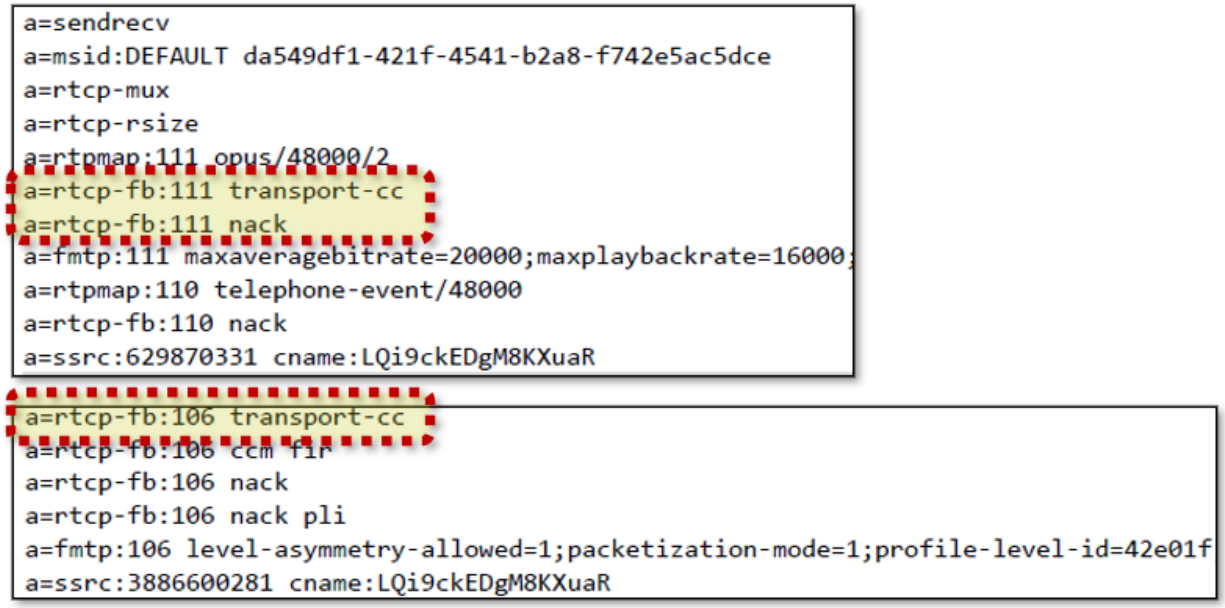
155. The Meta '285 Products estimate one or more network conditions of a media network a receiver report. Specifically, the Meta '285 Products estimate network conditions using receiver reports, as shown by the presence of feedback messages specifically designed for congestion control and bandwidth estimation. For example, the Meta '285 Products use "a=rtcp-fb:111 transport-cc." Transport-cc (transport-wide congestion control) relies on feedback from the receiver to adjust and optimize the sending bitrate based on current network quality indicators like packet loss, jitter, and round trip time. This feedback data, supplied by the receiver reports, is used by the Meta '285 Products to measure network conditions.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

156. The Meta '285 Products determine an optimal session bitrate using the estimated network conditions. Specifically, the Meta '285 Products use the network conditions from receiver reports to determine an optimal session bitrate, as shown in the use of "transport-cc." The use of "Transport-CC" adjusts the sending bitrate based on current network capacity and stability. By continuously assessing delay, loss, and receiver-estimated bandwidth, the Meta '285 Products

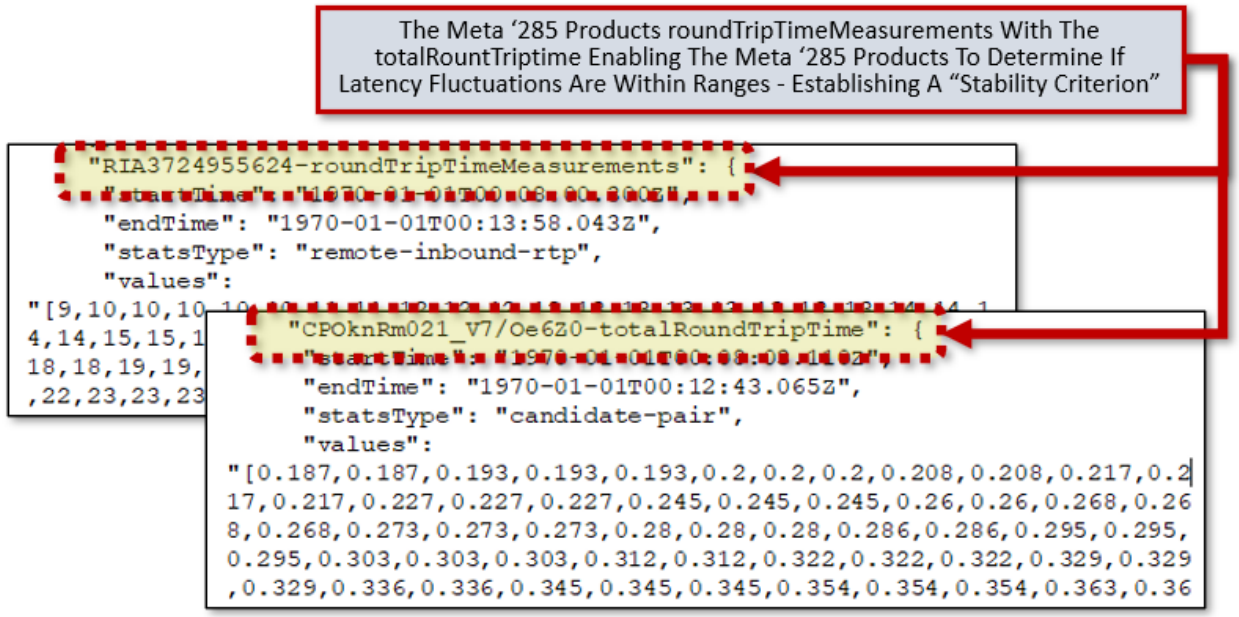
refine the outgoing bitrate to an optimal level. In addition, the Meta '285 Products use remote-inbound and remote-outbound statistics to receive and process network condition statistics from the receiver.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

157. The Meta '285 Products determine a stability criterion using the estimated network conditions based at least on one of (1) comparing a media time in transit and a round-trip time estimate and (2) comparing a bitrate received with a current bitrate session. This stability criterion is used by the Meta '285 Products to determine the stability of the network. Specifically, the Meta '285 Products use congestion control feedback mechanisms such as transport-cc that evaluate stability criteria derived from both timing and bitrate comparisons. For example, the Meta '285 Products utilize "roundTripTimeMeasurements" and "totalRoundTripTime." These metrics reflect how long media packets take to travel to the receiver and back, allowing the Meta '285 Products to compare "media time in transit" to the "round trip time estimate." This comparison is

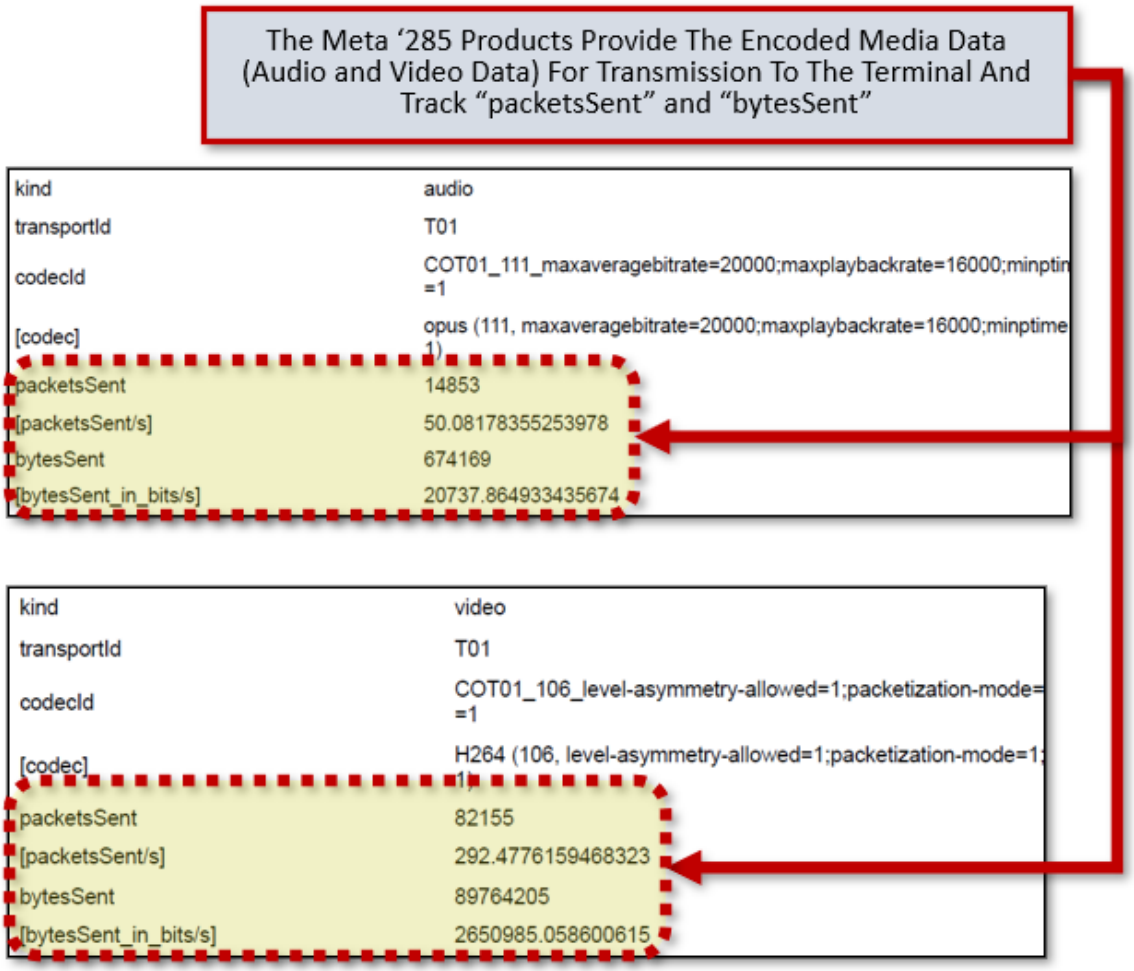
used by the Meta '285 Products to determine if a network is stable enough to sustain or increase the sending bitrate without causing quality issues or latency spikes.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

158. The Meta '285 Products provide the optimal session bitrate based at least in part on the media-network-stability determination. Specifically, the Meta '285 Products use congestion control to ensure that once stability is determined, the Meta '285 Products adjust the outgoing media stream's bitrate. For example, the Meta '285 Products use transport-wide congestion control "a=rtcp-fb:111 transport-cc" and metrics like "totalRoundTripTime" and "packetsLost" to determine network stability and select an appropriate sending rate. When these metrics suggest the network can handle more data, the Meta '285 Products raise the bitrate; if congestion is detected, the Meta '285 Products lower the bitrate. By considering round-trip times, packet loss, and receiver-estimated bandwidth together, the Meta '285 Products use the stability assessment to provide the optimal session bitrate to a terminal, maintaining a balance between smooth playback and high-quality transmission.

159. The Meta ‘285 Products provide media data to a terminal according to the optimal session bitrate. Specifically, the Meta ‘285 Products generate detailed “outbound-rtp” statistics that show the Meta ‘285 Products send media data at a certain bitrate to the terminal. For example, the Meta ‘285 Products will track “outbound-rtp (kind=audio, mid=0, ssrc=3724955624 ... packetsSent ... bytesSent ...).” These metrics show that the Meta ‘285 Products transmit encoded media packets according to a determined bitrate. Since the Meta ‘285 Products’ congestion control algorithms have already calculated an optimal session bitrate, the presence of these “outbound-rtp” statistics confirms that it is applying that rate in real-time, sending media data at the appropriate levels based on current network conditions. In addition, the Meta ‘285 Products use “transport-cc” to adjust the bitrate that media packets are sent. When network conditions are favorable, the Meta ‘285 Products increase the sending rate; if the network shows signs of congestion, the Meta ‘285 Products reduce the bitrate to maintain quality and stability.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

160. The Meta '285 Products maintain or incrementally increase the current bitrate when the network is considered normal. Specifically, the Meta '285 Products will increase the bitrate if the network conditions remain stable. The Meta '285 Products use "a=rtcp-fb:111 transport-cc," which shows the Meta '285 Products listen to continuous estimates from the receiver about available bandwidth. If these estimates and associated metrics (like low packet loss or stable round-trip times) show that the network can handle more data, the Meta '285 Products will try to push the bitrate slightly higher over time, ensuring improved audio and video quality.

161. Meta 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 Meta '285 Products.

162. The Meta '285 Products are available to businesses and individuals throughout the United States.

163. The Meta '285 Products are provided to businesses and individuals located in this District.

164. 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 Meta '285 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '285 Patent, including at least claim 2 pursuant to 35 U.S.C. § 271(a).

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

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

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

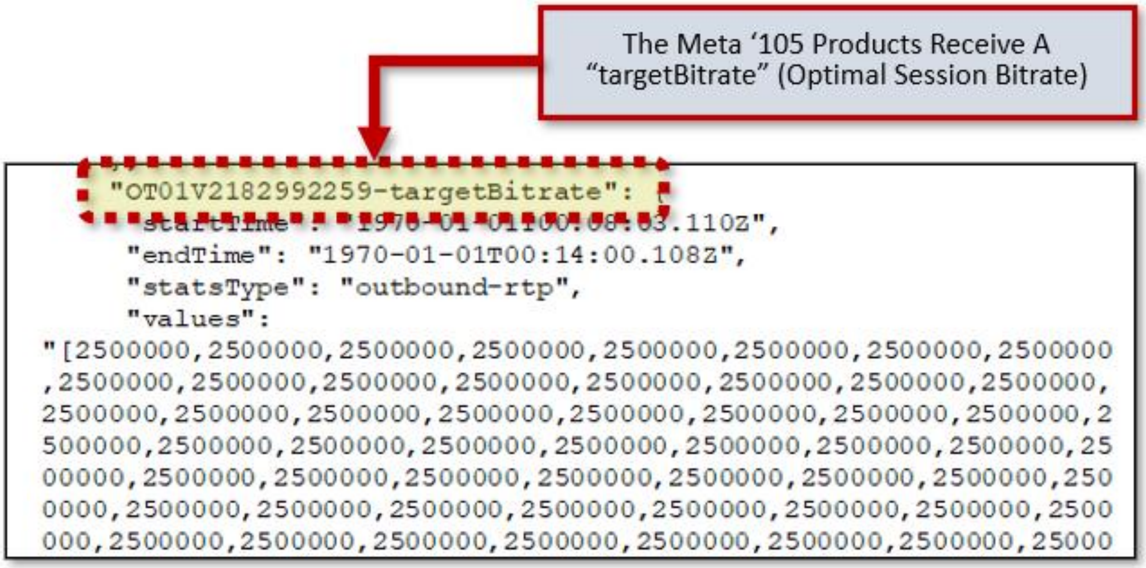
167. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

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

169. Meta designs, makes, sells, offers to sell, imports, and/or uses the following products: Facebook Messenger (Video Calls), Instagram (Video Calls), WhatsApp (Video Calls), Workplace by Meta (Video Calls), and Meta Horizon Workrooms (collectively, the "Meta '105 Product(s)").

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

171. The Meta '105 Products receive an optimal session bitrate. Specifically, the Meta '105 Products use "transport-cc" feedback messages to determine available network bandwidth. In addition, the Meta '105 Products contain the following variable *"a=rtcp-fb:111 transport-cc,"* which enables the Meta '105 Products to evaluate network conditions (e.g., congestion, packet loss, and latency) and adjust the bitrate allocation for audio and video in real-time. The Meta '105 Products update bitrate targets based on continuous performance data—reflected in parameters like *"a=fmtp:111 maxaveragebitrate=20000"* for audio or the extended feedback capabilities for video. The Meta '105 Products also receive a targetBitrate that is used to encode the media data.



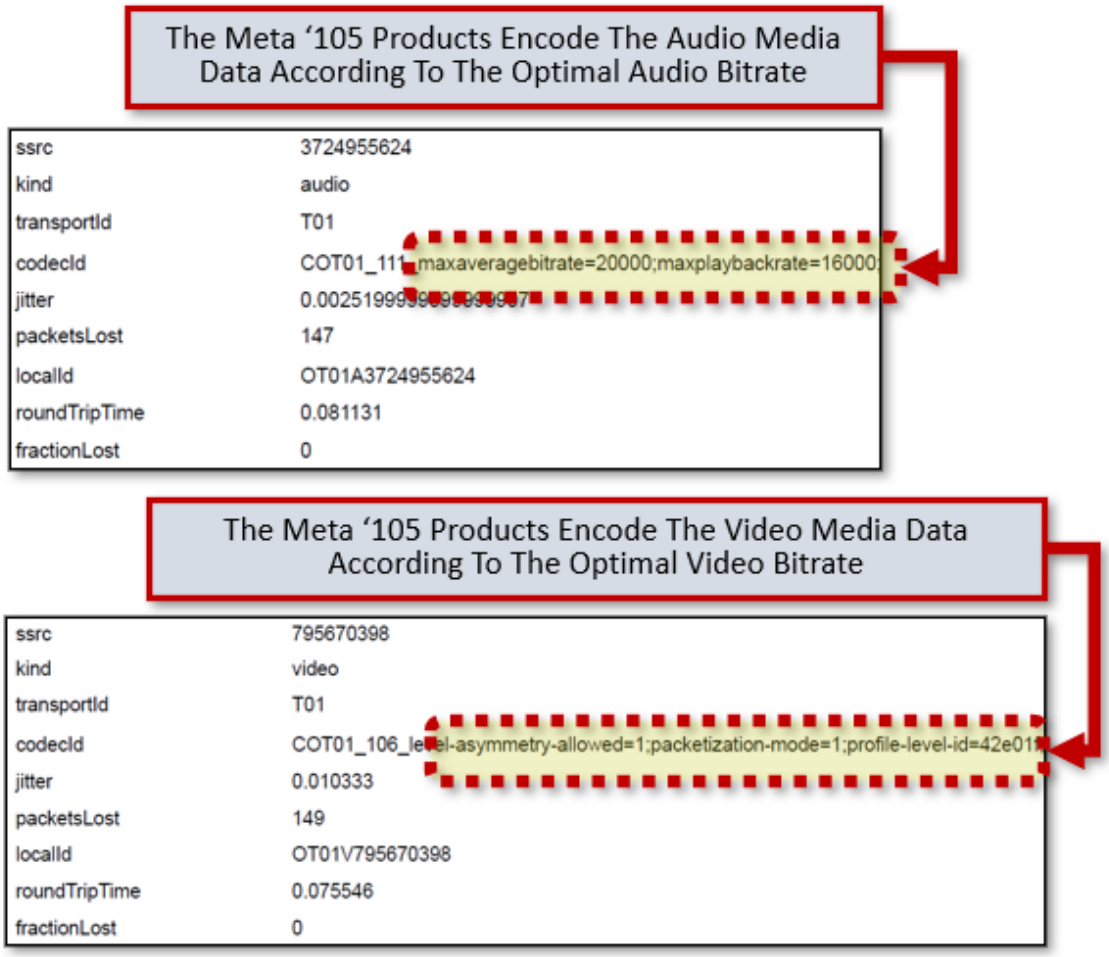
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

172. The Meta '105 Products allocate the optimal session bitrate between audio and video media data to produce an optimal audio bitrate and an optimal video bitrate. The Meta '105 Products allocate the optimal session bitrate between audio and video media data based on a metric selected from the following: (1) a predetermined allocation, (2) a user preference, (3) an optimal performance data, (4) privileging one type of data over the other, and (5) an amount of audio and video media data to be provided. Specifically, the Meta '105 Products allocate the optimal session bitrate between audio and video, ensuring both an optimal audio bitrate and an optimal video bitrate. The following parameters used by the Meta '105 Products show the products perform fine-grained control over audio and video streams. For instance, the Meta '105 Products contain an audio configuration parameter *"a=fmtp:111 maxaveragebitrate=20000;maxplaybackrate=16000;…"* which enable the Meta '105 Products to impose specific, predetermined allocations for the audio track. Similarly, the Meta '105 Products use video parameters such as *"a=fmtp:106 level-asymmetry-allowed=1;packetization-*

mode=1;profile-level-id=42e01f;…" to tailor video encoding strategies dynamically. Further, the Meta '105 Products use feedback mechanisms like *"a=rtcp-fb:111 transport-cc"* to optimize how the Meta '105 Products divide the available session bandwidth. If the network becomes congested, the Meta '105 Products reduce video bitrate (privileging audio) or adjust bitrates based on user preferences (e.g., a user might prefer stable audio over HD video). Additionally, user-driven scenarios—such as when a participant wants clearer speech—can lead to increasing the relative allocation for audio, thus demonstrating the impact of user preferences. These adaptive actions performed by the Meta '105 Products show the products allocate the optimal session bitrate between audio and video media data according to various metrics.

173. The Meta '105 Products encode audio and video media data according to the optimal audio bitrate and optimal video bitrate. Specifically, the Meta '105 Products not only determine optimal bitrates but also implement these targets by encoding the audio and video data. For example, the audio configuration set by the Meta '105 Products *"a=fmtp:111 maxaveragebitrate=20000;maxplaybackrate=16000;minptime=10;stereo=0;usedtx=1;useinbandfec=1"* specify exact parameters that the audio encoder in the Meta '105 Products use. This ensures that the audio track is encoded at the chosen optimal bitrate by the Meta '105 Products. Similarly, the Meta '105 Products use video configuration parameters like *"a=fmtp:106 level-asymmetry-allowed=1;packetization-mode=1;profile-level-id=42e01f;…"* to set the video encoder bitrate. The audio and video parameters used by the Meta '105 Products ensure the Meta '105 Products encode the audio and video media based on the optimal audio and video bitrates. Moreover, the continuous feedback tracking used by the Meta '105 Products ("*a=rtcp-fb:111 transport-cc")* ensures that any adjustments in network conditions or priorities translate into real-time encoder setting changes. When bandwidth conditions change, the Meta '105 Products modify

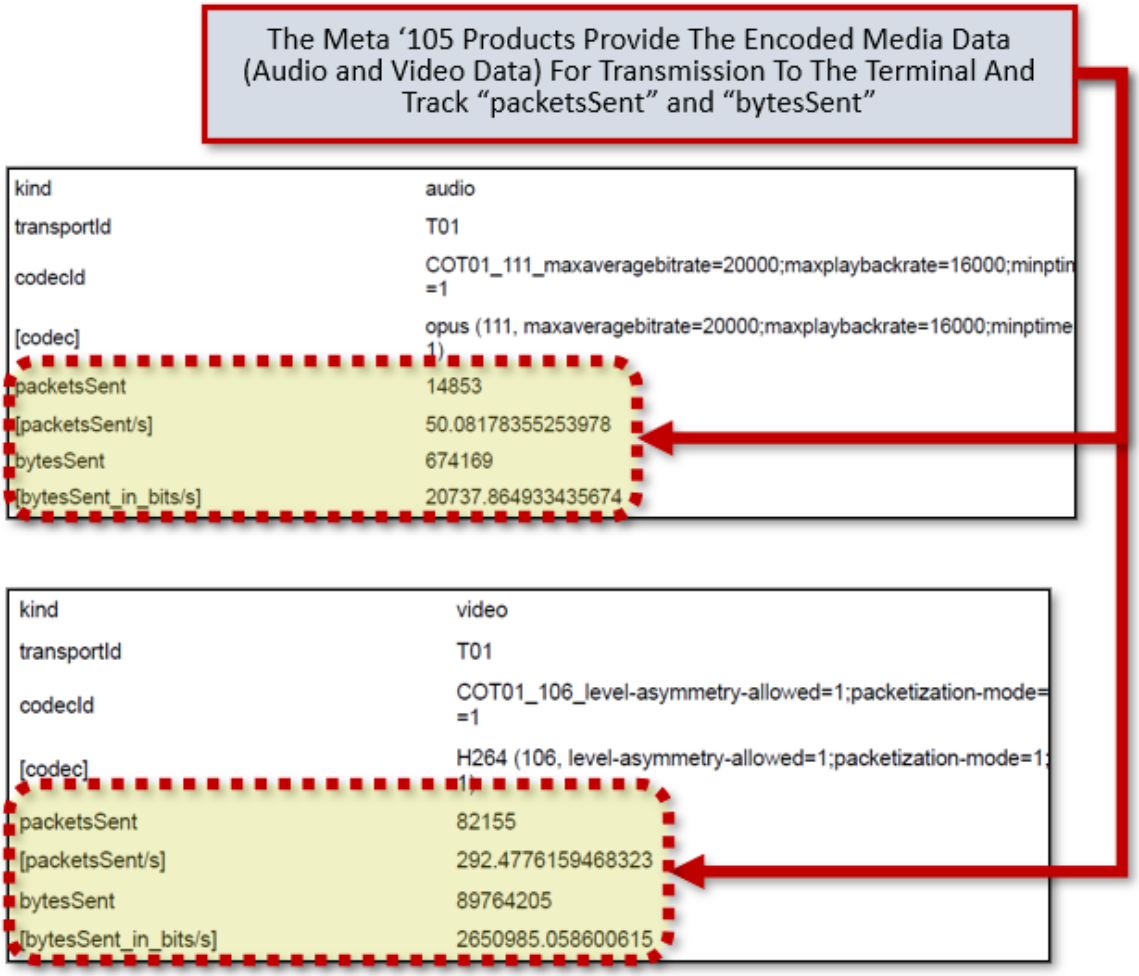
their encoding strategies—adjusting frame size, quality, and rate—so that the output media is encoded at the optimal audio and video bitrates.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

174. The Meta '105 Products provide the encoded audio and video data for transmittal to a terminal. Specifically, the Meta '105 Products generate detailed ICE candidate information, such as *"a=candidate:4246889868 1 udp 41690367 157.240.22.48 54665 typ relay"*, which show the Meta '105 Products negotiate traversal paths through network address translation and firewalls to ensure the encoded data is transmitted. Once these network paths are established, the Meta '105 Products send out the encoded packets, as indicated by metrics such as *"packetsSent"* and

"bytesSent", reported in the candidate pair statistics. These metrics generated by the Meta '105 Products show the products are actively transmitting the encoded media data over networks.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

175. Meta 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 Meta '105 Products.

176. The Meta '105 Products are available to businesses and individuals throughout the United States.

177. The Meta '105 Products are provided to businesses and individuals located in this District.

178. 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 Meta '105 Products, Meta 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).

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

180. As a result of Meta's infringement of the '105 Patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Meta's infringement, but in no event less than a reasonable royalty for the use made of the invention by Meta together with interest and costs as fixed by the Court.

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

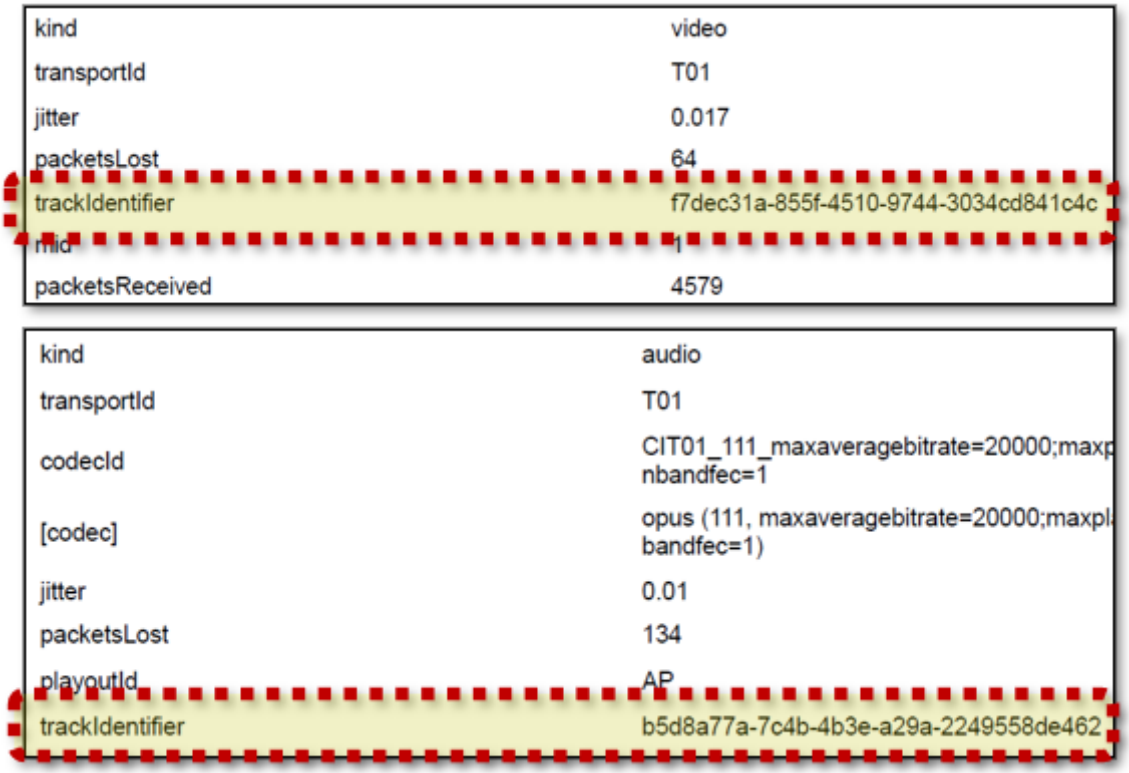
181. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

182. Meta 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.

183. Meta designs, makes, sells, offers to sell, imports, and/or uses the following products: Facebook Messenger (Video Calls), Instagram (Video Calls), WhatsApp (Video Calls), Workplace by Meta (Video Calls), and Meta Horizon Workrooms (collectively, the "Meta '141 Product(s)").

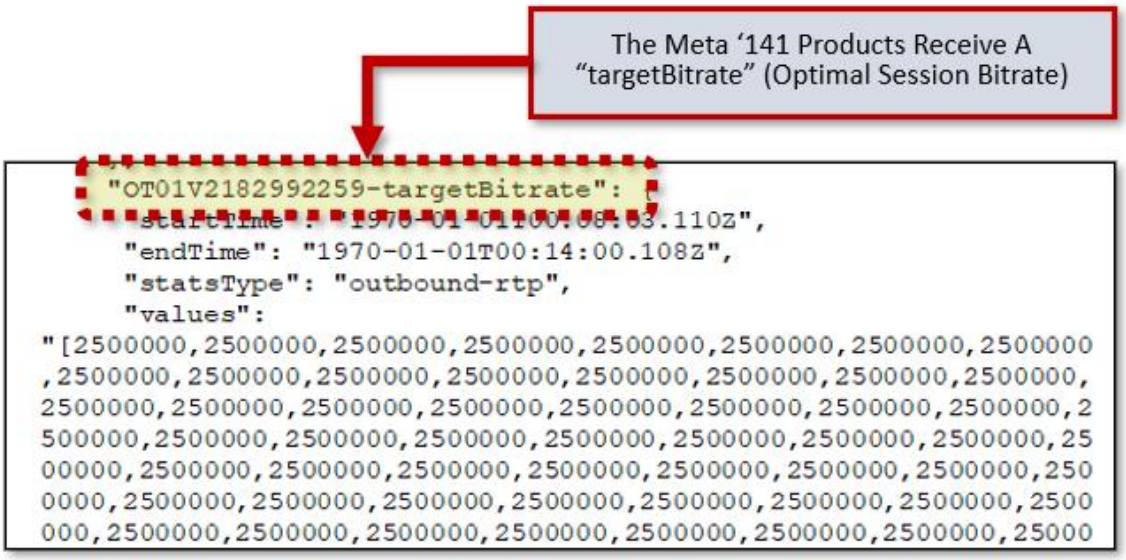
184. One or more Meta subsidiaries and/or affiliates use the Meta '141 Products in regular business operations.

185. The Meta '141 Products receive media data that includes audio media and video media data. Specifically, the Meta '141 Products generate Session Description Protocol (SDP) records that show the Meta '141 Products' use of specific codecs for both audio transmission (e.g., Opus codec at 48000Hz) and video transmission (e.g., H.264 codec). The Meta '141 Products use feedback parameters ("rtcp-fb") for both audio and video streams which show the Meta '141 Products receives and processes audio and video data. In addition, the Meta '141 Products, upon receiving video and media data, will create distinct audio and video tracks, each with unique identifiers and hardware associations. For example, the Meta '141 Products will generate a video track with an ID (e.g., "531d7605-997f-4f02-9e32-d82e7e874340") and an audio track with an ID (e.g., "86de80f5-e211-4e72-9cf5-de8eb766b226").



FACEBOOK MESSENGER (VIDEO CALLS), *available at:* https://facebook.com/messages (December 2024) (emphasis added).

186. The Meta '141 Products receive an optimal session bitrate. Specifically, the Meta '141 Products use "transport-cc" feedback messages to determine available network bandwidth. In addition, the Meta '141 Products contain the following variable *"a=rtcp-fb:111 transport-cc"* which enables the Meta '141 Products to evaluate network conditions (e.g., congestion, packet loss, and latency) and adjust the bitrate allocation for audio and video in real-time. The Meta '141 Products update bitrate targets based on continuous performance data—reflected in parameters like *"a=fmtp:111 maxaveragebitrate=20000"* for audio or the extended feedback capabilities for video. The Meta '141 Products also receive a targetBitrate that is used to encode the media data.

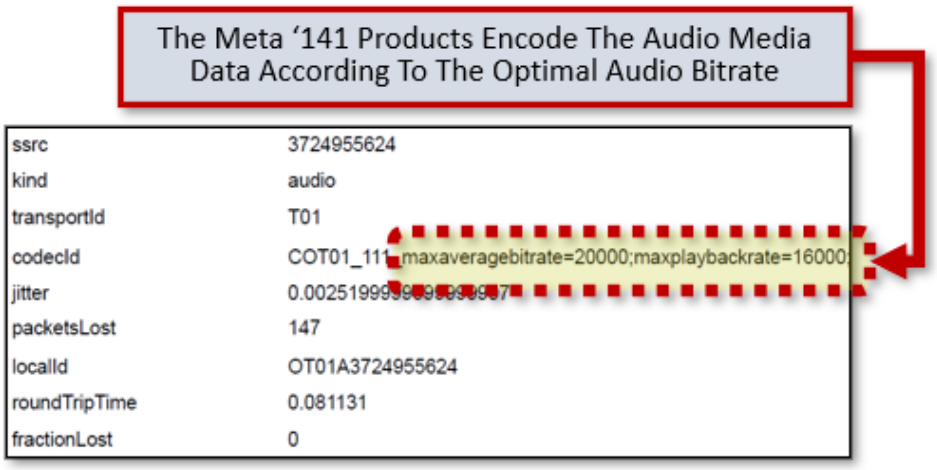


FACEBOOK MESSENGER (VIDEO CALLS), *available at:* https://facebook.com/messages (December 2024) (annotation added).

187. The Meta '141 Products allocate the optimal session bitrate between audio and video media data to produce an optimal audio bitrate and an optimal video bitrate. The Meta '141 Products allocate the optimal session bitrate between audio and video media data using parameters that constrain the audio bitrates: "a=fmtp:111 maxaveragebitrate=20000." This parameter places a specific maximum average bitrate on the audio stream, allocating a portion of the overall bandwidth to audio. Similarly, video parameters used by the Meta '141 Products used with "transport-cc" enable the Meta '141 Products to allocate video bitrates. The combination of constraints and feedback are used by the Meta '141 Products to balance audio and video bitrates, giving one priority over the other, depending on network conditions.

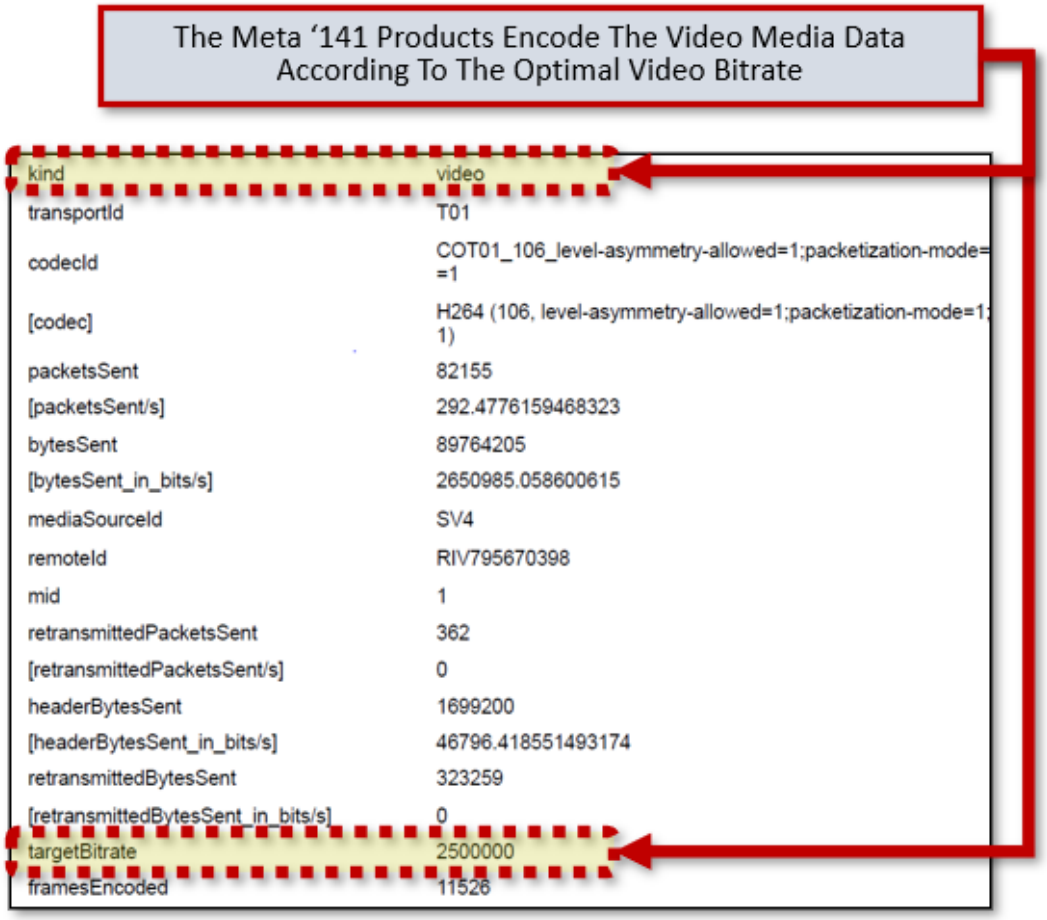
188. The Meta '141 Products encode the audio data using an optimal audio bitrate. Specifically, the Meta '141 Products utilize the Opus codec and session description protocol parameters to encode audio data at an optimal bitrate. For example, the Meta '141 Products use codec parameters for audio such as "a=fmtp:111 maxaveragebitrate=20000; maxplaybackrate=16000; minptime=10; stereo=0; usedtx=1; useinbandfec=1." The Meta '141

Products enable setting an audio encoding parameter (e.g., maxaveragebitrate=20000) that ensures the Meta '141 Products' audio encoder does not exceed a certain average bitrate. The Meta '141 Products also use discontinuous transmission and forward error correction using the usedtx=1 and useinbandfec=1 parameters to encode audio data using an optimal audio bitrate.



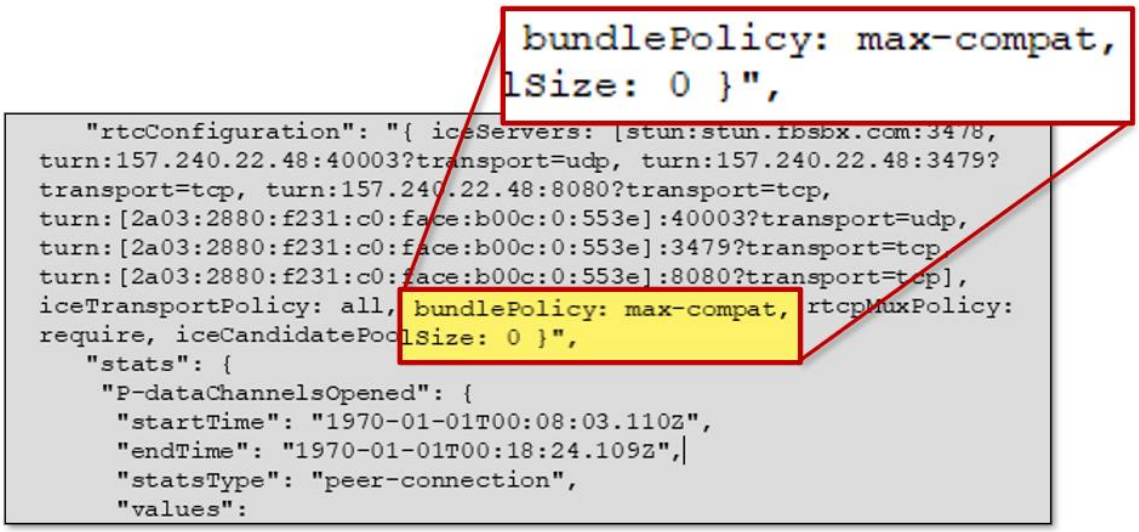
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

189. The Meta '141 Products encode the video data using an optimal video bitrate. Specifically, the Meta '141 Products set parameters including "encoderImplementation=OpenH264" and "targetBitrate=2500000," to select a specific video encoder and set a target bitrate based on network conditions. Additionally, the Meta '141 Products use feedback mechanisms (e.g., "a=rtcp-fb:106 transport-cc") to monitor bandwidth availability, packet loss, and latency that are then used to set the video encoding bitrate. Further, the Meta '141 Products use parameters such as "framesEncoded," "keyFramesEncoded," "totalEncodeTime," and "qpSum" to set and use an optimal video encoding bitrate. As bandwidth fluctuates, the Meta '141 Products will reduce the frame rate, lower the quantization parameter, and update the encoder's targetBitrate. When the network improves, the Meta '141 Products will increase the video encoding bitrate.



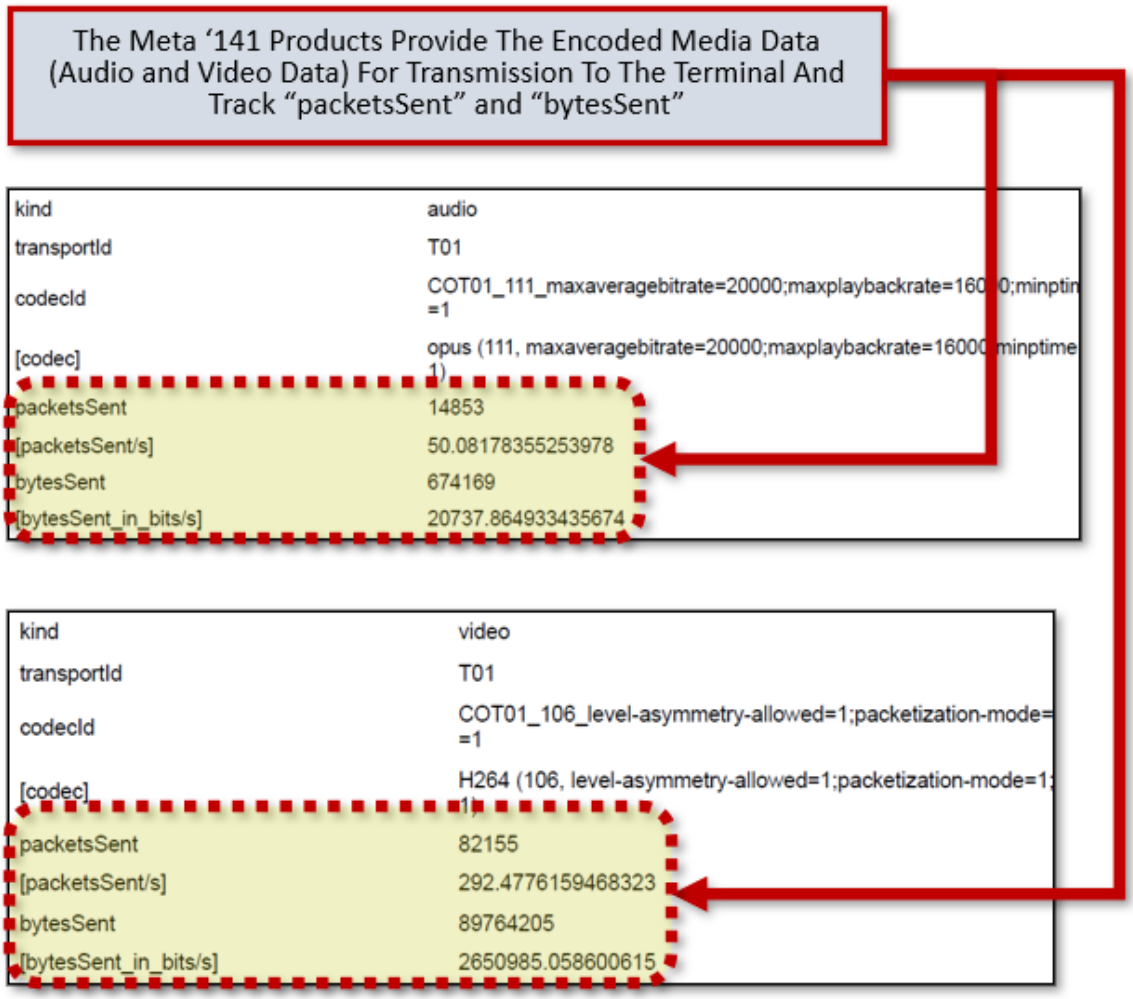
FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

190. The Meta '141 Products multiplex the encoded audio media data and the encoded video media data. The Meta '141 Products use "BUNDLE," which allows multiple media streams (audio and video) to be sent over a single transport connection: "a=group:BUNDLE 0 1 2." In addition, the Meta '141 Products use "a=rtcp-mux" to multiplex the audio and video data across a common RTCP channel.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (emphasis added).

191. The Meta '141 Products provide the encoded audio and video data for transmittal to a terminal. Specifically, the Meta '141 Products generate detailed ICE candidate information, such as *"a=candidate:4246889868 1 udp 41690367 157.240.22.48 54665 typ relay"*, which show the Meta '141 Products negotiate traversal paths through network address translation and firewalls to ensure the encoded data is transmitted. Once these network paths are established, the Meta '141 Products send out the encoded packets, as indicated by metrics such as *"packetsSent"* and *"bytesSent"*, reported in the candidate pair statistics. These metrics generated by the Meta '141 Products show the products are actively transmitting the encoded media data over networks.



FACEBOOK MESSENGER (VIDEO CALLS), *available at*: https://facebook.com/messages (December 2024) (annotation added).

192. Meta 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 the Meta '141 Products.

193. The Meta '141 Products are available to businesses and individuals throughout the United States.

194. The Meta '141 Products are provided to businesses and individuals located in this District.

195. 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 to the Meta '141 Products, Meta 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).

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

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

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

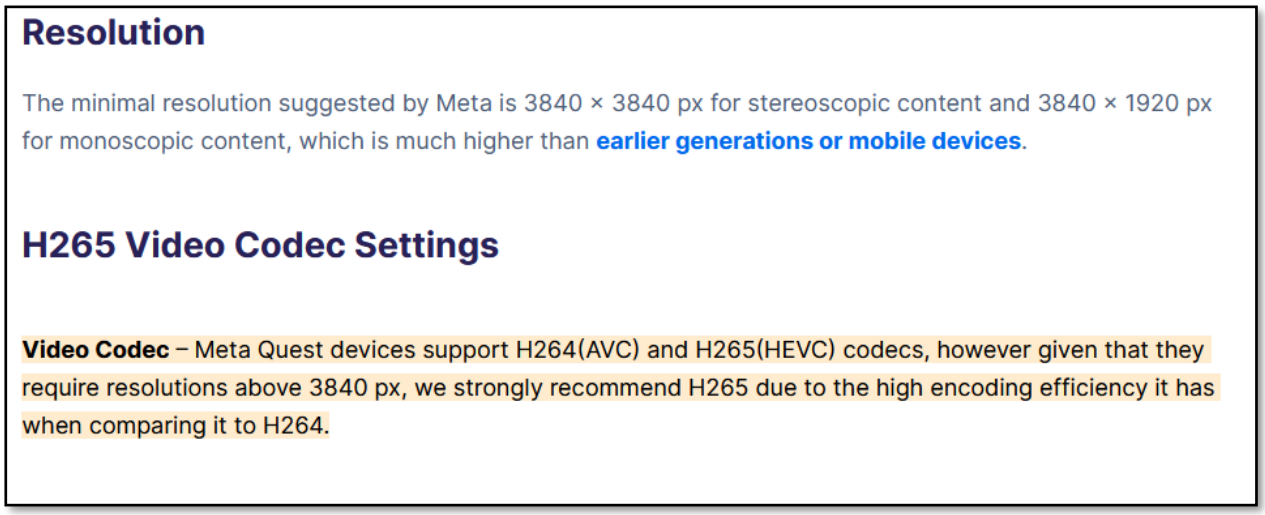
198. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

199. Meta 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.

200. Meta designs, makes, sells, offers to sell, imports, and/or uses products that perform encoding of media data in compliance with the H.265 High Efficiency Video Coding (HEVC) compression standard, including but not limited to Meta Quest Devices and Instagram Reels (collectively, the "Meta '388 Product(s)").

201. Meta designs, makes, sells, offers to sell, imports, and/or uses Meta '388 Products that comply with the H.265 video encoding standard. The Meta '388 Products perform video

processing compliant with the H.265 High Efficiency Video Coding (HEVC) standard. Specifically, the Meta '388 Products perform HEVC encoding.



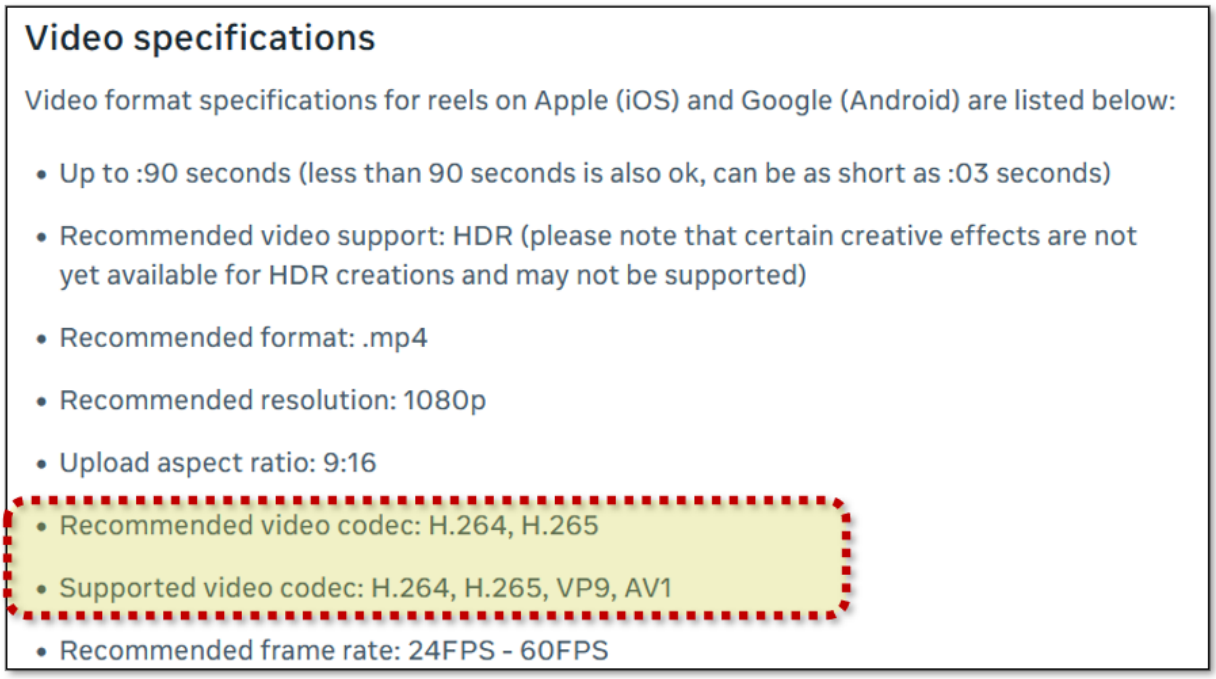
Resolution

The minimal resolution suggested by Meta is 3840 × 3840 px for stereoscopic content and 3840 × 1920 px for monoscopic content, which is much higher than **earlier generations or mobile devices**.

H265 Video Codec Settings

Video Codec – Meta Quest devices support H264(AVC) and H265(HEVC) codecs, however given that they require resolutions above 3840 px, we strongly recommend H265 due to the high encoding efficiency it has when comparing it to H264.

Gabriel Davila Revelo, *Encoding VR and 360 Immersive Video for Meta Quest Headsets*, BITMOVIN DEVELOPERS BLOG (November 14, 2023), *available at:* https://bitmovin.com/blog/best-encoding-settings-meta-vr-360-headsets (annotation added).



Video specifications

Video format specifications for reels on Apple (iOS) and Google (Android) are listed below:

- Up to :90 seconds (less than 90 seconds is also ok, can be as short as :03 seconds)
- Recommended video support: HDR (please note that certain creative effects are not yet available for HDR creations and may not be supported)
- Recommended format: .mp4
- Recommended resolution: 1080p
- Upload aspect ratio: 9:16
- Recommended video codec: H.264, H.265
- Supported video codec: H.264, H.265, VP9, AV1
- Recommended frame rate: 24FPS - 60FPS

Requirements for Facebook Reels, META BUSINESS HELP CENTER, *available at*: https://www.facebook.com/business/help/1197310377458196 (last visited December 2024) (emphasis added).

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

203. The Meta '388 Products identify an initial quantization parameter employed to compress a previously decoded frame.

204. The Meta '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 Meta '388 Products must set an initial QP value that serves as the baseline for encoding the decoded frame.

205. The Meta '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.

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

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

208. The Meta '388 Products determine a second quantization parameter using the initial QP and the delta QP. The Meta '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.

209. The Meta '388 Products compress the decoded frame utilizing the second quantization parameter.

210. The Meta '388 Products encode the video frames using the newly derived second quantization parameter.

211. By complying with the HEVC standard, the Meta '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 Meta'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."

212. 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 Meta '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 Meta '388 Products must, therefore, encode frames using this newly computed QP2 to meet the standard's rate and quality stipulations.

213. Meta 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 Meta '388 Products.

214. The Meta '388 Products are available to businesses and individuals throughout the United States.

215. The Meta '388 Products are provided to businesses and individuals located in this District.

216. 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 Meta '388 Products, Meta 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).

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

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

COUNT VIII
INFRINGEMENT OF U.S. PATENT NO. 9,894,361

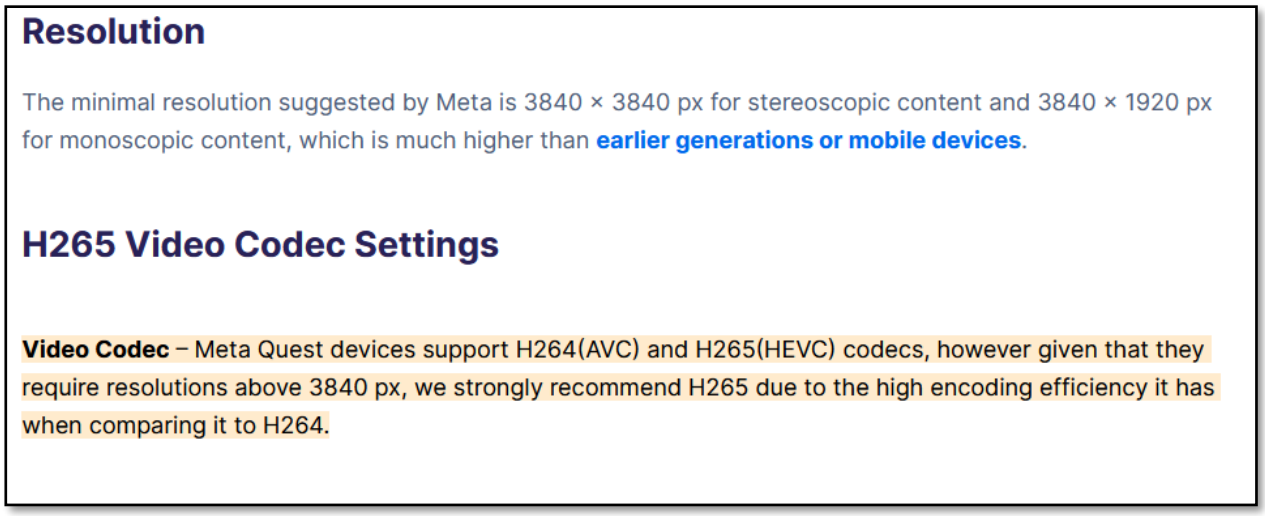
219. Plaintiff references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

220. Meta designs, makes, uses, sells, and/or offers for sale in the United States products containing technology for quality-aware video optimization.

221. Meta designs, makes, sells, offers to sell, imports, and/or uses that perform encoding of media data in compliance with the H.265 High Efficiency Video Coding (HEVC) compression standard, including but not limited to Meta Quest Devices and Instagram Reels (collectively, the "Meta '361 Product(s)").

222. One or more Meta subsidiaries and/or affiliates use the Meta '361 Products in regular business operations.

223. Meta designs, makes, sells, offers to sell, imports, and/or uses Meta '361 Products that comply with the H.265 video encoding standard. The Meta '361 Products perform video processing compliant with the H.265 High Efficiency Video Coding (HEVC) standard. Specifically, the Meta '361 Products perform HEVC encoding.



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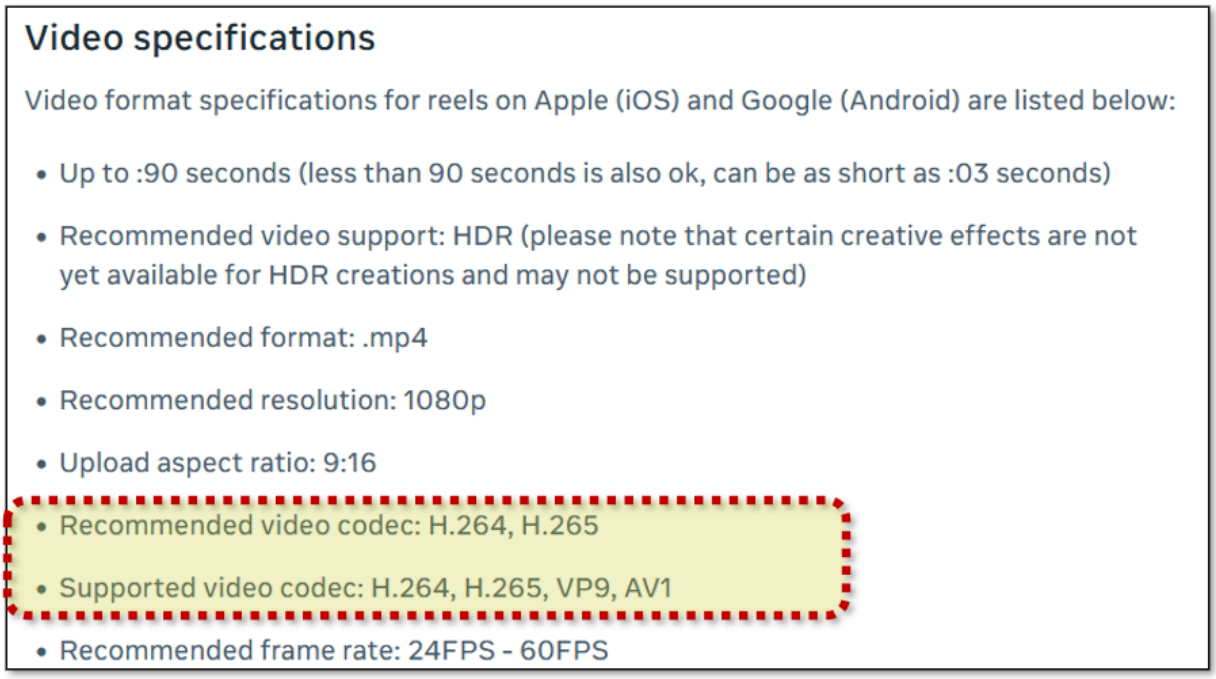
Gabriel Davila Revelo, *Encoding VR and 360 Immersive Video for Meta Quest Headsets*, BITMOVIN DEVELOPERS BLOG (November 14, 2023), *available at:* https://bitmovin.com/blog/best-encoding-settings-meta-vr-360-headsets (annotation added).



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- Supported video codec: H.264, H.265, VP9, AV1
- Recommended frame rate: 24FPS - 60FPS

Requirements for Facebook Reels, META BUSINESS HELP CENTER, *available at*: https://www.facebook.com/business/help/1197310377458196 (last visited December 2024) (emphasis added).

224. The Meta '361 Products unpack a compressed video frame from a series containing multiple video frames.

225. The Meta ‘361 Products take an encoded video frame as input. This frame is one in a series that consists of multiple frames. The encoded frame is then passed through a decoding pipeline by the Meta ‘361 Products. The Meta ‘361 Products use inverse quantization and inverse DCT (Discrete Cosine Transform) functions, to revert the video data to a decompressed state suitable for further manipulation.

226. The Meta ‘361 Products obtain an initial Quantization Parameter (QP) from the unpacked video frame, where this initial QP is indicative of the quantization configurations initially applied to compress the video frame.

227. The Meta ‘361 Products extract a first Quantization Parameter (QP) from the video frame metadata or from the bitstream itself. This first QP reflects the quantization settings initially applied during the original encoding. This first QP is read from the slice header or similar control structures and used to modulate the quantization matrices in the decoding process.

228. The Meta ‘361 Products calculate a delta QP influenced by the initial QP.

229. Upon acquiring the first QP, a delta QP is calculated by the Meta ‘361 Products. This delta QP value is computed through a set of heuristic functions to optimize for certain objectives like bitrate reduction, video quality, or computational efficiency. The delta QP acquired by the Meta ‘361 Products is a function of the first QP and other parameters, such as frame type (I-frame, P-frame, etc.).

230. The Meta ‘361 Products derive an inflation factor through comparing the total byte size of video frames after and before decompression, where both the newly received compressed frame and those previously decompressed belong to the same series of multiple video frames.

231. The Meta ‘361 Products compute an inflation adjustment factor based on the total byte size of previously decompressed frames and those frames post-compression. This comparison aids in estimating the compression efficiency.

232. The Meta ‘361 Products acquire a subsequent QP influenced by both the delta QP and the inflation factor, wherein this subsequent QP is indicative of the quantization configurations to be applied for recompressing the unpacked frame.

233. The second QP is then acquired by the Meta ‘361 Products by combining the calculated delta QP and the inflation adjustment. This second quantization parameter acquired by the Meta ‘361 Products aims to balance the trade-offs between quality and bitrate, taking into account the information gleaned from previous frames as indicated by the inflation adjustment.

234. The Meta ‘361 Products compress the unpacked video frame utilizing the subsequent QP.

235. The decompressed video frame is re-encoded based on the second QP by the Meta ‘361 Products. The frame is then serialized into a bitstream and packaged with appropriate headers and metadata for transmission or storage.

236. Meta has directly infringed and continues to directly infringe the ‘361 patent by, among other things, making, using, offering for sale, and/or selling technology for quality-aware video optimization, including but not limited to the Meta ‘361 Products.

237. The Meta ‘361 Products are available to businesses and individuals throughout the United States.

238. The Meta ‘361 Products are provided to businesses and individuals located in this District.

239. By making, using, testing, offering for sale, and/or selling products and services comprising technology for quality-aware video optimization, including but not limited to the Meta '361 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '361 Patent, including at least claim 10 pursuant to 35 U.S.C. § 271(a).

240. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '361 Patent.

241. As a result of Meta's infringement of the '361 Patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Meta's infringement, but in no event less than a reasonable royalty for the use made of the invention by Meta together with interest and costs as fixed by the Court.

COUNT IX
INFRINGEMENT OF U.S. PATENT NO. 10,123,015

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

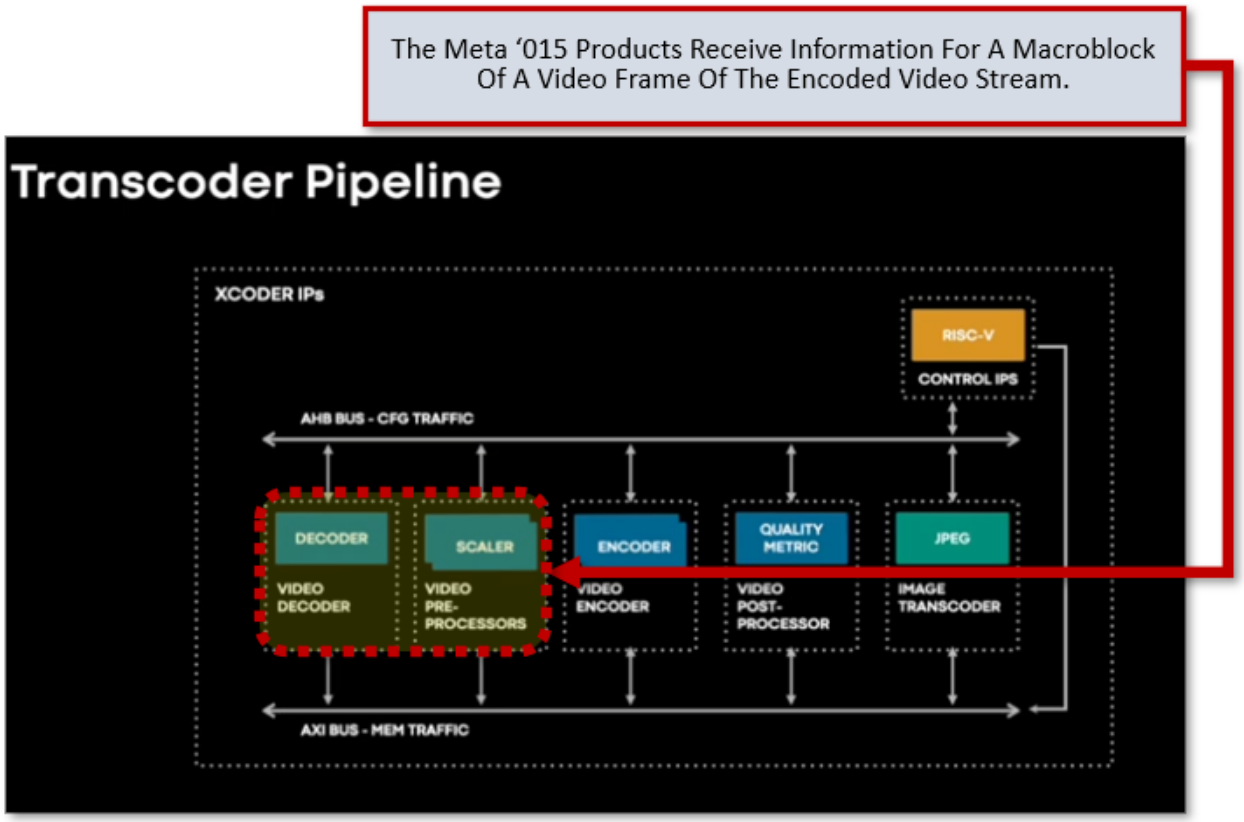
243. Meta designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for optimizing encoded video streams by tailoring quality settings for macroblocks.

244. Meta designs, makes, sells, offers to sell, imports, and/or uses the Meta Scalable Video Processor ("MSVP") and Meta products and services that use MSVP for video encoding and/or transcoding (collectively, the "Meta '015 Product(s)").

245. One or more Meta subsidiaries and/or affiliates use the Meta '015 Products in regular business operations.

246. The Meta '015 Products optimize encoded video streams comprised of video frames. Each video frame is comprised of a plurality of macroblocks.

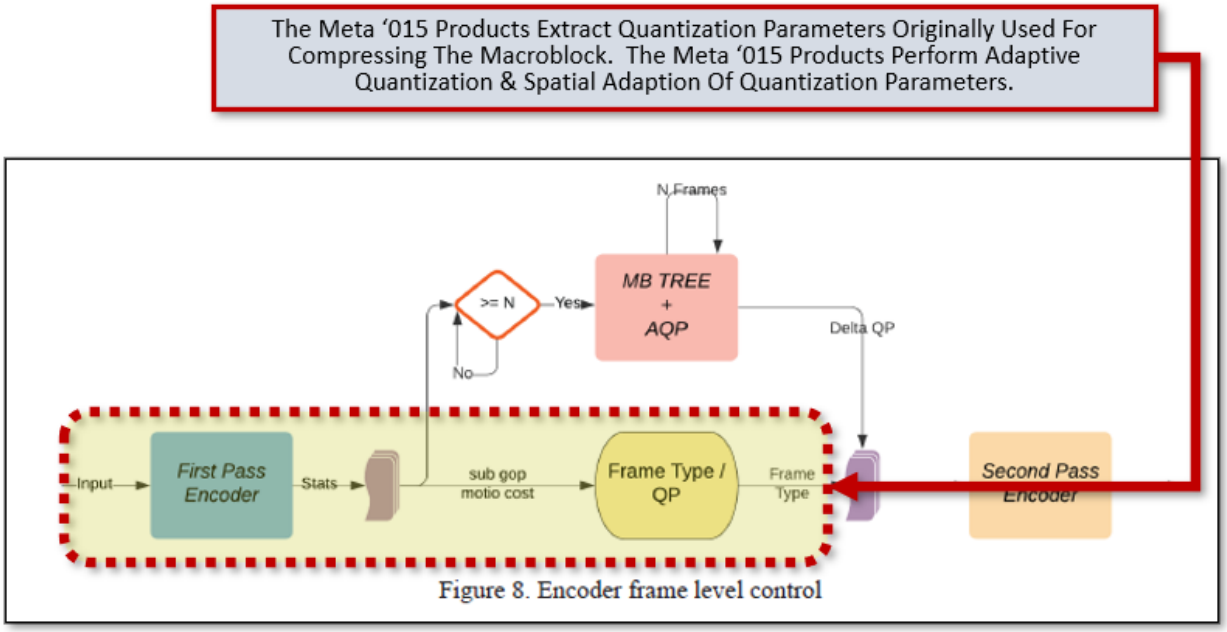
247. The Meta '015 Products receive information for a macroblock of a video frame of the encoded video stream. Specifically, in video encoding, frames are divided into macroblocks. When MSVP "transcodes," it starts by receiving an already encoded video stream (for example, H.264 or VP9). As part of decoding, the Meta '015 Products processes information at the macroblock or block level to reconstruct the image.



Ioannis Katsavounidis and Harikrishna Reddy, *MSVP: Meta's Scalable Video Processor*, META @SCALE CONFERENCE PRESENTATION (May 18, 2023), *available at*: https://www.youtube.com/watch?v=J-sys8b3WhU.

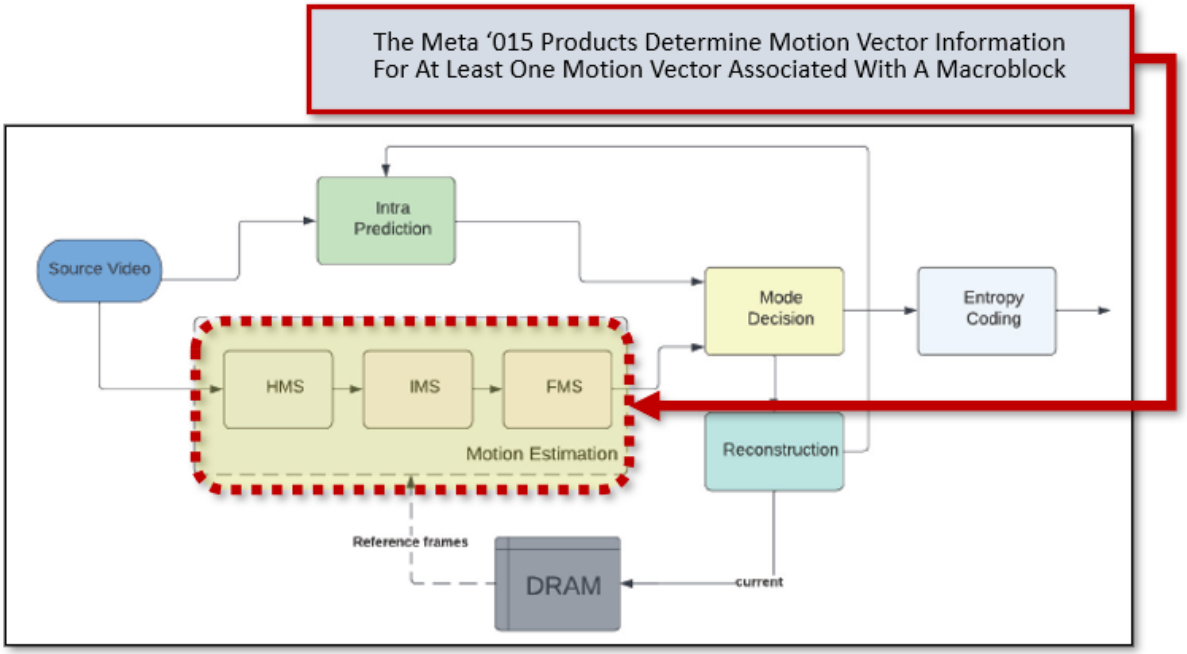
248. The Meta '015 Products extract a first quantization parameter corresponding to quantization settings originally used for compressing the macroblock. Specifically, the original encoding process of the input video contains quantization parameters (QP) to compress each macroblock. This QP value is embedded in the compressed bitstream as part of the video encoding syntax. When the Meta '015 Products decode the input, the Meta '015 Products interpret these

parameters to correctly reconstruct the image - extracting the original QP settings used in the input bitstream's compression step.



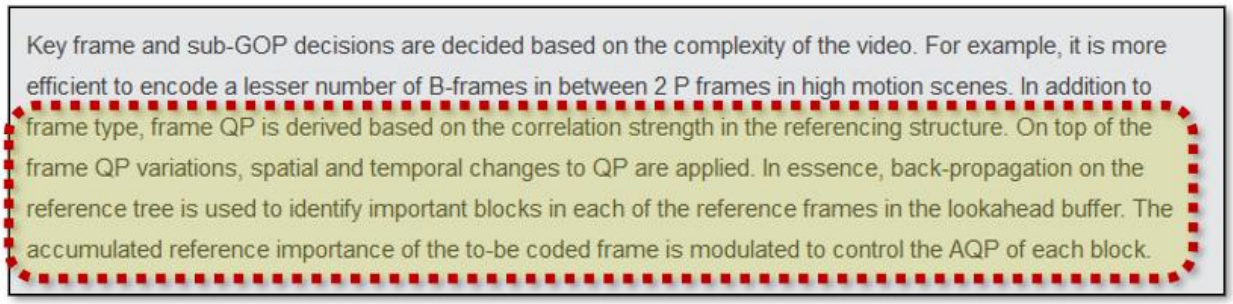
H.M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (emphasis added).

249. The Meta '015 Products determine, using the received information, motion vector information for at least one motion vector associated with the macroblock that indicates a location of at least one prediction block within the video frame or another video frame which was subtracted from the macroblock prior to encoding. Specifically, the Meta '015 Products, during decoding, obtain motion vectors from the compressed bitstream to reconstruct the frame. The motion vector information is used by the Meta '015 Products to locate the appropriate reference area that was originally subtracted from the macroblock before encoding.



H.M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (emphasis added).

250. The Meta '015 Products compute a second quantization parameter for re-encoding the macroblock, the second quantization parameter is based in part on the first quantization parameter and the motion vector information. Specifically, the Meta '015 Products use adaptive quantization and rate-distortion optimization (RDO), which involve calculating a suitable new QP value. This new QP (the second quantization parameter) is based on the originally extracted QP and motion vectors information (as well as other spatial and temporal complexities of the video).



M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (emphasis added).

251. The Meta '015 Products re-encode the macroblock based on the second quantization parameter. Specifically, the Meta '015 Products, after generating the original QP, motion vectors, and frame-level data, apply these parameters to the hardware encoding pipeline. The Meta '015 Products use rate-distortion optimization and mode decision processes to determine the best way to encode each macroblock. The second QP, derived from the earlier steps, guides how much compression is applied. The Meta '015 Products re-encode each macroblock with the second QP to produce a new encoded video stream.

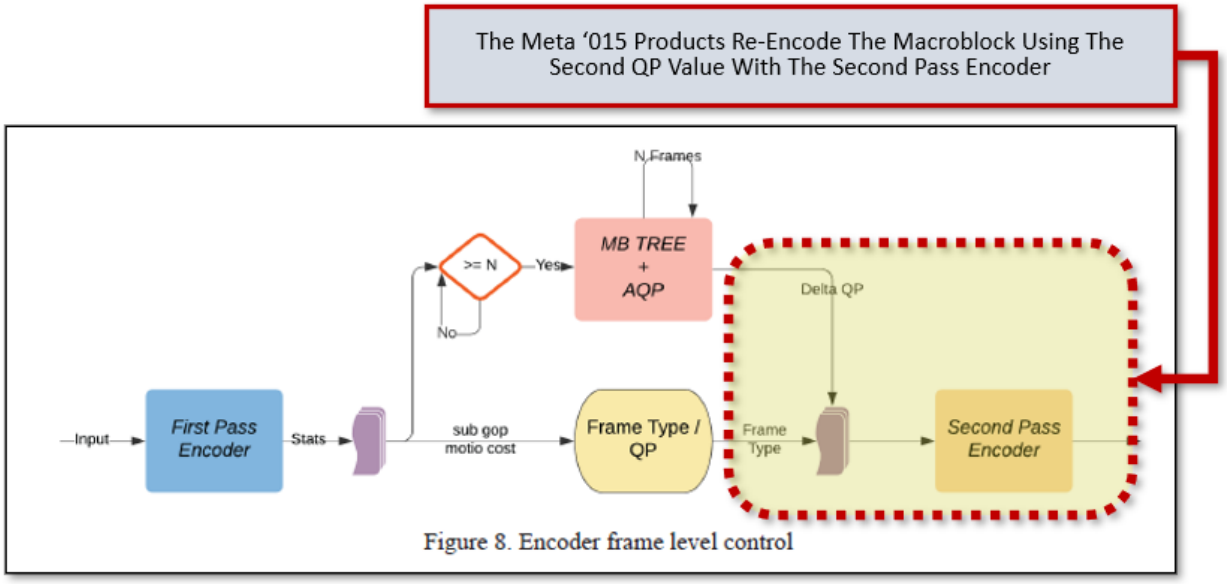


Figure 8. Encoder frame level control

H.M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (emphasis added).

252. The Meta '015 Products transmit the re-encoded macroblock to a user device.

253. Meta has directly infringed and continues to directly infringe the '015 Patent by, among other things, making, using, offering for sale, and/or selling technology for optimizing encoded video streams by tailoring quality settings for macroblocks, including but not limited to the Meta '015 Products.

254. The Meta ‘015 Products are available to businesses and individuals throughout the United States.

255. The Meta ‘015 Products are provided to businesses and individuals located in this District.

256. By making, using, testing, offering for sale, and/or selling products and services comprising technology for optimizing encoded video streams by tailoring quality settings for macroblocks, including but not limited to the Meta ‘015 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the ‘015 patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

257. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘015 Patent.

258. As a result of Meta’s infringement of the ‘015 Patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Meta’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Meta together with interest and costs as fixed by the Court.

COUNT X
INFRINGEMENT OF U.S. PATENT NO. 9,621,896

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

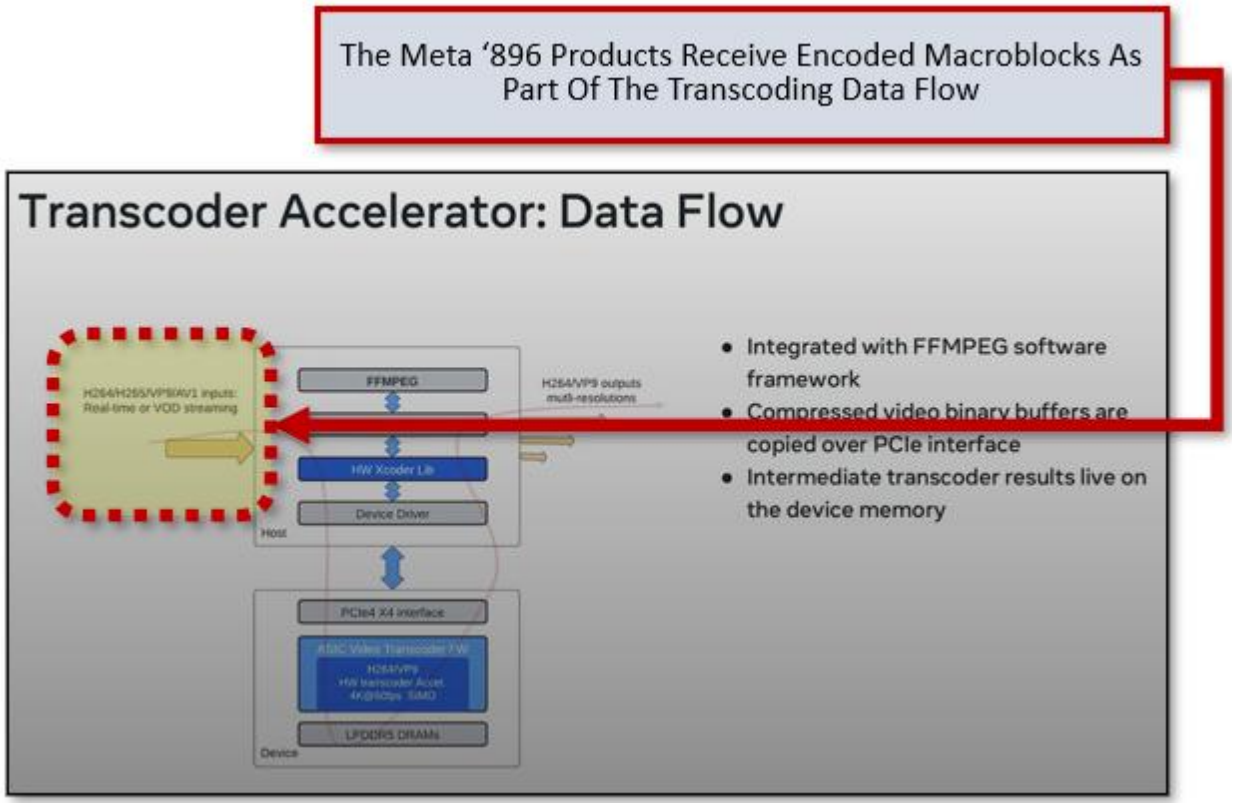
260. Meta designs, makes, uses, sells, and/or offers for sale in the United States products comprising technology for optimizing encoded video streams by tailoring quality settings for macroblocks.

261. Meta designs, makes, sells, offers to sell, imports, and/or uses the Meta Scalable Video Processor ("MSVP") and Meta products and services that use MSVP for video encoding and/or transcoding (collectively, the "Meta '896 Product(s)").

262. One or more Meta subsidiaries and/or affiliates use the Meta '896 Products in regular business operations.

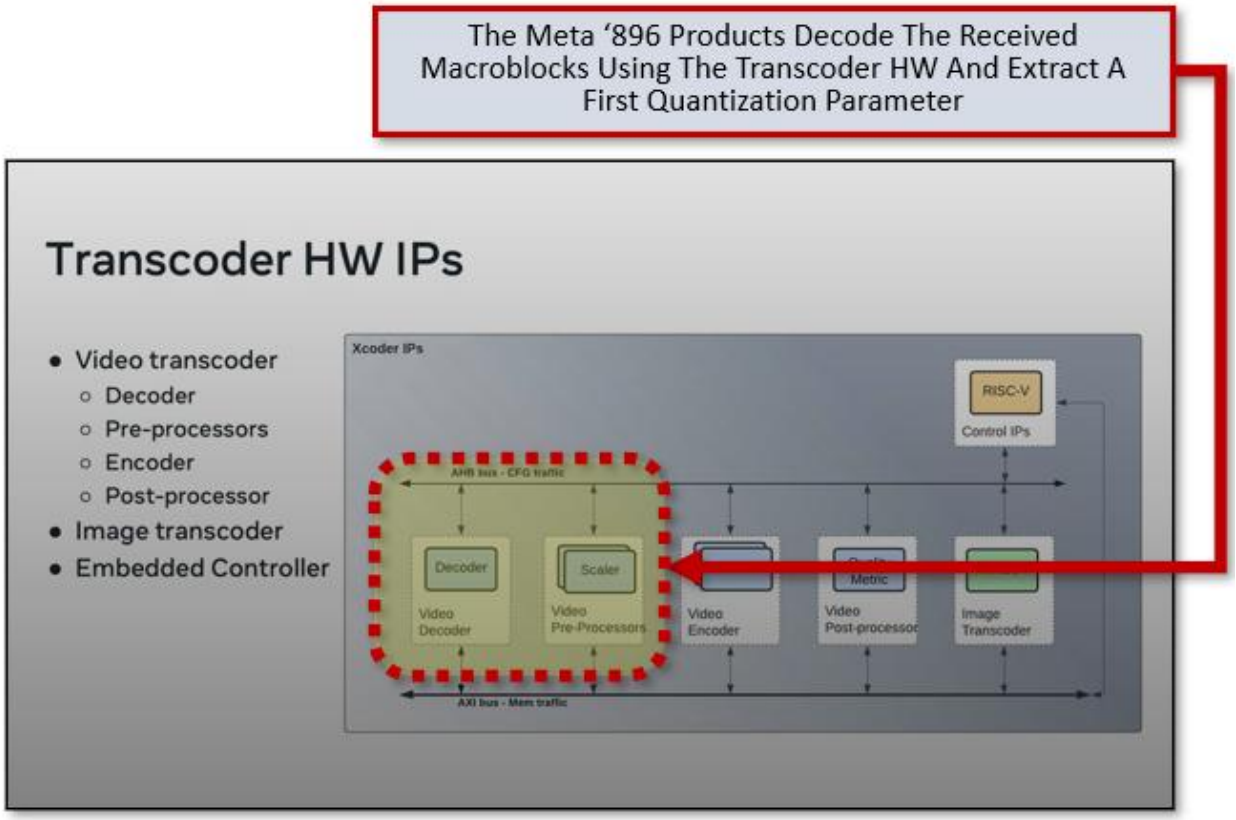
263. The Meta '896 Products optimize on a macroblock-level encoded video streams that are made up of video frames. Each video frame comprises a plurality of macroblocks, which in turn are comprised of a plurality of pixels.

264. The Meta '896 Products receive an encoded macroblock. Specifically, the Meta '896 products receive a fully encoded video stream in formats like H.264, HEVC, or VP9. Each video stream is composed of encoded frames, and frames are composed of encoded blocks (macroblocks). As part of the decoding process, the Meta '896 Products receive these encoded macroblocks



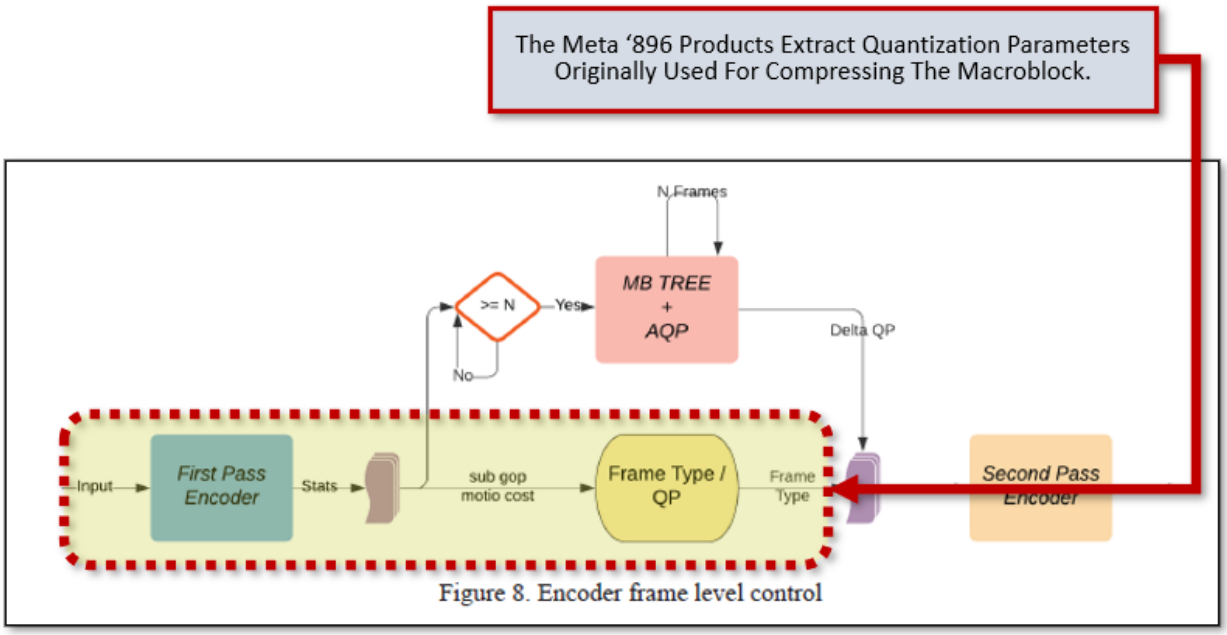
Efficient Video Processing at Scale Using MSVP, SPIE OPTICS AND PHOTONICS CONFERENCE 2023 (August 23, 2023), *available at*: https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12674/1267414 (annotation added).

265. The Meta '896 Products decode the encoded macroblocks. Specifically, the Meta '896 products include a hardware video decoder IP block capable of decoding input bitstreams. During the decoding process the Meta '896 Products read and extract their syntax elements (like quantization parameters, motion vectors, and transform coefficients) for the received macroblocks.



Efficient Video Processing at Scale Using MSVP, SPIE OPTICS AND PHOTONICS CONFERENCE 2023 (August 23, 2023), *available at*: https://www.spiedigitallibrary.org/conference-proceedings-of-spie/12674/1267414 (annotation added).

266. The Meta '896 Products extract a first quantization parameter, wherein the first quantization parameter corresponds to quantization settings originally used for compressing the encoded macroblock. Specifically, the Meta '896 Products read the syntax elements in the encoded macroblocks, including quantization parameters used during the original encoding. The original QP values are part of the compressed bitstream syntax that is extracted by the Meta '896 Products.



H.M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (annotation added).

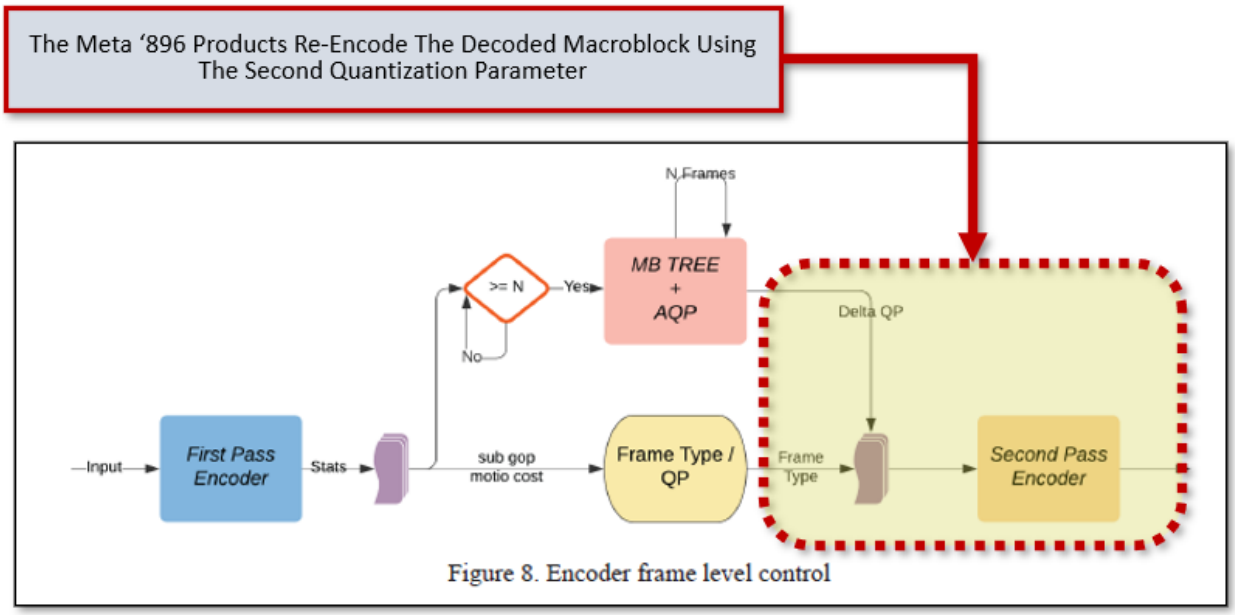
267. The Meta '896 Products determine first and second thresholds as a function of past input quantization parameters, wherein the past input quantization parameters correspond to quantization settings originally used for compressing a plurality of previously received encoded macroblocks. Specifically, the Meta '896 Products use two-pass / multi-pass encoding that collects statistics (like motion complexity, bit usage, and previous frame QPs during encoding). These past QP values are used to determine thresholds.

> Key frame and sub-GOP decisions are decided based on the complexity of the video. For example, it is more efficient to encode a lesser number of B-frames in between 2 P frames in high motion scenes. In addition to frame type, frame QP is derived based on the correlation strength in the referencing structure. On top of the frame QP variations, spatial and temporal changes to QP are applied. In essence, back-propagation on the reference tree is used to identify important blocks in each of the reference frames in the lookahead buffer. The accumulated reference importance of the to-be coded frame is modulated to control the AQP of each block.

M. Reddy et al., *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (emphasis added).

268. The Meta '896 Products compute a second quantization parameter based at least in part on the first quantization parameter, the first and second thresholds, and a number of bits occupied by the encoded macroblock. Specifically, the Meta '896 Products compute a second QP for re-encoding. In addition, the Meta '896 Products use adaptive quantization (AQP) and rate-distortion optimization processes that utilize spatial/temporal complexity, motion vectors, and bit budgets for calculating a second QP value.

269. The Meta '896 Products re-encode the decoded macroblock based on the second quantization parameter. Specifically, the Meta '896 Products after decoding and processing the received macroblocks, re-encodes the macroblocks using the second QP value.



H.M. Reddy et al, *Efficient Video Processing at Scale Using MSVP*, SPIE 12674, APPLICATIONS OF DIGITAL IMAGE PROCESSING XLVI (October 4, 2023) (annotation added).

270. The Meta '896 Products provide the re-encoded macroblock.

271. Meta has directly infringed and continues to directly infringe the '896 Patent by, among other things, making, using, offering for sale, and/or selling technology for optimizing

encoded video streams by tailoring quality settings for macroblocks, including but not limited to the Meta '896 Products.

272. The Meta '896 Products are available to businesses and individuals throughout the United States.

273. The Meta '896 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 technology for optimizing encoded video streams by tailoring quality settings for macroblocks, including but not limited to the Meta '896 Products, Meta has injured Plaintiff and is liable to Plaintiff for directly infringing one or more claims of the '896 Patent, including at least claim 1 pursuant to 35 U.S.C. § 271(a).

275. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '896 Patent.

276. As a result of Meta's infringement of the '896 Patent, Plaintiff has suffered monetary damages, and seek recovery in an amount adequate to compensate for Meta's infringement, but in no event less than a reasonable royalty for the use made of the invention by Meta 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 Meta has infringed, either literally and/or under the doctrine of equivalents, the '273, '664, '061, '285, '105, '141, '388, '361, '015, and '896 Patents;

B. An award of damages resulting from Meta's acts of infringement in

accordance with 35 U.S.C. § 284;

C. 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 Meta.

D. 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: December 23, 2024

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