RUSS, AUGUST & KABAT
Marc A. Fenster (CA SBN 181067)
Email: mfenster@raklaw.com
Brian D. Ledahl (CA SBN 186579)
Email: bledahl@raklaw.com
Reza Mirzaie (CA SBN 246953)
Email: rmirzaie@raklaw.com
Paul Kroeger (CA SBN 229074)
Email: pkroeger@raklaw.com
C. Jay Chung (CA SBN 252794)
Email: jchung@raklaw.com
Philip X. Wang (CA SBN 262239)
Email: pwang@raklaw.com
12424 Wilshire Boulevard, 12th Floor
Los Angeles, CA 90025
Telephone: 310/826-7474
Facsimile 310/826-6991

Attorneys for Plaintiff
REALTIME ADAPTIVE STREAMING LLC

UNITED STATES DISTRICT COURT

CENTRAL DISTRICT OF CALIFORNIA

WESTERN DIVISION

REALTIME ADAPTIVE STREAMING LLC,

Plaintiff,

v.

NETFLIX, INC. and

NETFLIX STREAMING SERVICES, INC.,

Defendants.

Case No. 2:19-cv-06361-GW-JC

FIRST AMENDED COMPLAINT FOR PATENT INFRINGEMENT

JURY TRIAL DEMANDED

This is an action for patent infringement arising under the Patent Laws of the United States of America, 35 U.S.C. § 1 et seq. in which Plaintiff Realtime Adaptive Streaming LLC ("Plaintiff" or "Realtime") makes the following allegations against Defendants Netflix, Inc. and Netflix Streaming Services, Inc. (collectively "Netflix" or "Defendants")

PARTIES

1. Realtime is a Texas limited liability company. Realtime has a place of business at 66 Palmer Avenue, Suite 27, Bronxville, NY 10708. Realtime has researched and developed specific solutions for data compression, including, for example, those that increase the speeds at which data can be stored and accessed. As recognition of its innovations rooted in this technological field, Realtime holds multiple United States patents and pending patent applications.

2. Defendant Netflix, Inc. is a Delaware corporation, with its principal place of business at 100 Winchester Circle, Los Gatos, California 95032. Netflix, Inc. may be served with process by serving its registered agent, The Corporation Trust Company at the Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

3. Defendant Netflix Streaming Services, Inc. is a Delaware corporation, with its principal place of business at 100 Winchester Circle, Los Gatos, California 95032. Netflix Streaming Services, Inc. may be served with process by serving its registered agent, The Corporation Trust Company at the Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

4. Defendants have regular and established place of business in this District, including, e.g., in Los Angeles, CA. *See, e.g.,* https://jobs.netflix.com/locations/los-angeles-california

JURISDICTION AND VENUE

5. This action arises under the patent laws of the United States, Title 35 of the United States Code. This Court has original subject matter jurisdiction pursuant to 28 U.S.C. §§ 1331 and 1338(a).

6. This Court has personal jurisdiction over Defendants in this action because Defendants have committed acts within this District giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Defendants would not offend traditional notions of fair play and substantial justice. Defendants have also committed and continue to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the asserted patents.

7. Venue is proper in this district, *e.g.*, under 28 U.S.C. § 1400(b). Defendants has committed acts of direct and indirect infringement in this District, and has a regular and established place of business in this District, including, e.g., in Los Angeles.

THE PATENTS-IN-SUIT

8. This action arises under 35 U.S.C. § 271 for Netflix's infringement of Realtime's United States Patent Nos. 7,386,046 (the "'046 patent"), 8,934,535 (the "'535 patent"), 8,054,879 (the "'879 patent"), and 9,769,477 (the "'477 patent") (collectively, the "Patents-In-Suit").

9. The '046 patent, titled "Bandwidth Sensitive Data Compression and Decompression," was duly and properly issued by the United States Patent and Trademark Office ("USPTO") on June 10, 2008. A copy of the '046 patent is attached hereto as **Exhibit A.** Realtime is the owner and assignee of the '046 patent and holds the right to sue for and recover all damages for infringement thereof, including past infringement.

10. The '535 patent, titled "Systems and methods for video and audio data storage and distribution," was duly and properly issued by the USPTO on January

13, 2015. A copy of the '535 patent is attached hereto as **Exhibit B** Realtime is the owner and assignee of the '535 patent and holds the right to sue for and recover all damages for infringement thereof, including past infringement.

11. The '879 patent, titled "Bandwidth Sensitive Data Compression and Decompression," was duly and properly issued by the USPTO on November 8, 2011. A copy of the '879 patent is attached hereto as **Exhibit C**. Realtime is the owner and assignee of the '879 patent and holds the right to sue for and recover all damages for infringement thereof, including past infringement.

12. The '477 patent, titled "Video data compression systems," was duly and properly issued by the USPTO on September 19, 2017. A copy of the '477 patent is attached hereto as **Exhibit D**. Realtime is the owner and assignee of the '477 patent and holds the right to sue for and recover all damages for infringement thereof, including past infringement.

COUNT I

INFRINGEMENT OF U.S. PATENT NO. 7,386,046

13. Plaintiff re-alleges and incorporates by reference the foregoing paragraphs, as if fully set forth herein.

14. On information and belief, Netflix has made, used, offered for sale, sold and/or imported into the United States Netflix products that infringe the '046 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Netflix's streaming video service; Netflix's video encoders or codecs including x264, x265 and libvpx; and Netflix's mobile encoders, encoders or codecs including AVCMain (H.264/AVC Main), H.264/AVC High, VP9, AVCHi-Mobile and VP9-Mobile, and all versions and variations thereof since the issuance of the '046 patent ("Accused Instrumentalities").

15. For example, an official website from Netflix known as "The Netflix Tech Blog" states that Netflix is "introducing two new types of mobile encodes –

AVCHi-Mobile and VP9-Mobile…All the changes combined result in better video quality for the same bitrate compared to our current streams (**AVCMain**). Many Netflix-ready devices receive streams which are encoded using the **H.264/AVC Main profile (AVCMain)**. This is a widely-used video compression format, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. However, newer formats are available that offer more sophisticated video coding tools. For our mobile bitstreams we adopt two compression formats: **H.264/AVC High profile and VP9 (profile 0)**. Similar to Main profile, **the High profile of H.264/AVC** enjoys broad decoder support. **VP9**, a royalty-free format developed by Google, is supported on the majority of Android devices, Chrome, and a growing number of consumer devices." (emphasis added). *See* https://medium.com/netflix-techblog/more-efficient-mobile-encodes-for-netflix-downloads-625d7b082909.

16. As confirmation, an article from Variety states that "Netflix has been using H.264/AVC almost exclusively" and "That's why Netflix is also encoding its downloadable videos with a different flavor of H.264/AVC, which is also known as a different profile. (For the technically inclined: Netflix's streams are encoded with **H.264/AVC Main,** whereas its downloads come in **H.264/AVC High**. The company shared more details on its tech blog this week.) This isn't quite as effective as using VP9, but still allows Netflix to shave off some bits." *See* Janko Roettgers, *Variety*, December 2, 2016, "How Netflix Delivers Better-Looking Downloads Without Eating Up All Your Phone Storage," http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/.

17. In another entry of Netflix's "The Netflix Tech Blog," a test comparing several different encoders was described: "H.264/AVC is a very widely-used video compression standard on the Internet, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. **x264**

is the most established open-source software encoder for H.264/AVC…**x265** is an open-source HEVC encoder, originally ported from the x264 codebase. Concurrent to HEVC, Google developed VP9 as a royalty-free video compression format and released **libvpx** as an open-source software library for encoding VP9." *See* https://medium.com/netflix-techblog/a-large-scale-comparison-of-x264-x265-and-libvpx-a-sneak-peek-2e81e88f8b0f.

18. The Accused Instrumentalities determine a parameter of at least a portion of a video data block. As shown below, examples of such parameters include bitrate (or max video bitrate) and resolution parameters. Different parameters correspond with different end applications. H.264 provides for multiple different ranges of such parameters, each included in the "profiles" and "levels" as defined by the H.264 standard, from the below shown paragraphs from a white paper and Wikipedia. *See* http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5:

4. H.264 profiles and levels

The joint group involved in defining H.264 focused on creating a simple and clean solution, limiting options and features to a minimum. An important aspect of the standard, as with other video standards, is providing the capabilities in profiles (sets of algorithmic features) and levels (performance classes) that optimally support popular productions and common formats.

H.264 has seven profiles, each targeting a specific class of applications. Each profile defines what feature set the encoder may use and limits the decoder implementation complexity.

Network cameras and video encoders will most likely use a profile called the baseline profile, which is intended primarily for applications with limited computing resources. The baseline profile is the most suitable given the available performance in a real-time encoder that is embedded in a network video product. The profile also enables low latency, which is an important requirement of surveillance video and also particularly important in enabling real-time, pan/tilt/zoom (PTZ) control in PTZ network cameras.

H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements. Each level defines the bit rate and the encoding rate in macroblock per second for resolutions ranging from QCIF to HDTV and beyond. The higher the resolution, the higher the level required.

See https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Levels with maximum property values

Level	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s			Examples for high resolution @ highest frame rate (max stored frames) Toggle additional details
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile	
1	380,160	1,485	25,344	99	64	80	192	176×144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176×144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352×288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352×288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352×288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352×288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352×576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720×576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720×576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280×720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280×1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048×1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048×1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048×1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672×1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@56.3 (5)

21. A video data block is organized by the group of pictures (GOP) structure, which is a "collection of successive pictures within a coded video stream." *See* https://en.wikipedia.org/wiki/Group_of_pictures. A GOP structure can contain intra coded pictures (I picture or I frame), predictive coded pictures (P picture or P frame), bipredictive coded pictures (B picture or B frame) and direct coded pictures (D picture or D frames, or DC direct coded pictures which are used only in MPEG-1 video). *See* https://en.wikipedia.org/wiki/Video_compression_picture_types (for descriptions of I frames, P frames and B frames); https://en.wikipedia.org/wiki/MPEG-1#D-frames (for descriptions of D frames). Thus, at least a portion of a video data block would also make up a GOP structure and could also contain I frames, P frames, B frames and/or D frames. The GOP structure also reflects the size of a video data block, and the GOP structure can be controlled and used to fine-tune other parameters (e.g. bitrate, max video bitrate and resolution parameters) or even be considered as a parameter by itself.

22. Based on the bitrate and/or resolution parameter identified (e.g. bitrate, max video bitrate, resolution, GOP structure or frame type within a GOP structure), any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., "baseline," "extended," "main", or "high") corresponds with that parameter, then select between at least two asymmetric compressors. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding ("CAVLC") entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding ("CABAC") entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8×8 vs. 4×4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	**Static** - Probabilities never change	**Adaptive** - Adjusts probabilities based on actual data
• Leverages correlation between symbols	**No** - Conditional probabilities ignored	**Yes** - Exploits symbol correlations by using "contexts"
• Non-integer code words	**No** - Low coding efficiency forhigh probability symbols	**Yes** - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. *See* https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

entropy_coding_mode_flag selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:

– If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).

– Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

23. The Accused Instrumentalities compress the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks, which can be organized in a GOP structure (see above). After its selection, the asymmetric compressor (CAVLC or CABAC) will

compress the video data to provide various compressed data blocks, which can also be organized in a GOP structure, as discussed previously above. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

Entropy Coding

For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may requires a 30-40% of total processing power to be accomplished.

See http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf at 13:

Typical compression ratios to maintain excellent quality are:

- 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 60:1 for general video using H.264 and WMV9

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.

The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.

The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.

The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

24. Therefore, from at least the above, Netflix has directly infringed and

continues to infringe the '046 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the system claimed by Claim 1 of the '046 patent, namely, a method comprising: compressing data using a first compression routine providing a first compression rate, wherein the first compression routine comprises a first compression algorithm; tracking the throughput of a data processing system to determine if the first compression rate provides a throughput that meets a predetermined throughput threshold, wherein said tracking throughput comprises tracking a number of pending requests for data transmission; and when the tracked throughput does not meet the predetermined throughput threshold, compressing data using a second compression routine providing a second compression rate that is greater than the first compression rate, to increase the throughput of the data processing system to at least the predetermined throughput level, wherein the second compression routine comprises a second compression algorithm. Upon information and belief, Netflix uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to their customers.

25. On information and belief, the Accused Instrumentalities store at least a portion of the one or more compressed data blocks in buffers, hard disk, or other forms of memory/storage.

26. On information and belief, Netflix also directly infringes and continues to infringe other claims of the '046 patent.

27. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, e.g., in the manner specified in the H.264 standard.

28. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the systems and/or

methods claimed by the '046 patent.

29. On information and belief, Netflix has had knowledge of the '046 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Netflix knew of the '046 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Netflix will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '046 patent.

30. Upon information and belief, Netflix's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '046 patent by practicing a method comprising: compressing data using a first compression routine providing a first compression rate, wherein the first compression routine comprises a first compression algorithm; tracking the throughput of a data processing system to determine if the first compression rate provides a throughput that meets a predetermined throughput threshold, wherein said tracking throughput comprises tracking a number of pending requests for data transmission; and when the tracked throughput does not meet the predetermined throughput threshold, compressing data using a second compression routine providing a second compression rate that is greater than the first compression rate, to increase the throughput of the data processing system to at least the predetermined throughput level, wherein the second compression routine comprises a second compression algorithm. For example, Netflix adopted H.264 as its video codec in its products/services, such as its streaming services, and uses H.264 as an encoder, encode or codec. For similar reasons, Netflix also induces its customers to use the Accused Instrumentalities to

infringe other claims of the '046 patent. Netflix specifically intended and was aware that these normal and customary activities would infringe the '046 patent. Netflix performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '046 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Netflix engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Netflix has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '046 patent, knowing that such use constitutes infringement of the '046 patent. Accordingly, Netflix has been, and currently is, inducing infringement of the '046 patent, in violation of 35 U.S.C. § 271(b).

31. Netflix has also infringed, and continues to infringe, claims of the '046 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '046 patent, and constitute a material part of the invention. Netflix knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '046 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Netflix has been, and currently is, contributorily infringing the '046 patent, in violation of 35 U.S.C. § 271(c).

32. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Netflix has injured Realtime and is liable to Realtime for infringement of the '046 patent pursuant to 35 U.S.C. § 271.

33. As a result of Netflix's infringement of the '046 patent, Plaintiff

Realtime is entitled to monetary damages in an amount adequate to compensate for Netflix's infringement, but in no event less than a reasonable royalty for the use made of the invention by Netflix, together with interest and costs as fixed by the Court.

COUNT II

INFRINGEMENT OF U.S. PATENT NO. 8,934,535

34. Plaintiff re-alleges and incorporates by reference the foregoing paragraphs, as if fully set forth herein.

35. On information and belief, Netflix has made, used, offered for sale, sold and/or imported into the United States Netflix products that infringe the '535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Netflix's streaming video service; Netflix's video encoders or codecs including x264, x265 and libvpx; and Netflix's mobile encoders, encoders or codecs including AVCMain (H.264/AVC Main), H.264/AVC High, VP9, AVCHi-Mobile and VP9-Mobile, and all versions and variations thereof since the issuance of the '535 patent ("Accused Instrumentalities").

36. For example, an official website from Netflix known as "The Netflix Tech Blog" states that Netflix is "introducing two new types of mobile encodes – **AVCHi-Mobile and VP9-Mobile**…All the changes combined result in better video quality for the same bitrate compared to our current streams (**AVCMain**). Many Netflix-ready devices receive streams which are encoded using the **H.264/AVC Main profile (AVCMain)**. This is a widely-used video compression format, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. However, newer formats are available that offer more sophisticated video coding tools. For our mobile bitstreams we adopt two compression formats: **H.264/AVC High profile and VP9 (profile 0)**. Similar to Main profile, **the High profile of H.264/AVC** enjoys broad decoder support. **VP9**,

a royalty-free format developed by Google, is supported on the majority of Android devices, Chrome, and a growing number of consumer devices." (emphasis added). *See* https://medium.com/netflix-techblog/more-efficient-mobile-encodes-for-netflix-downloads-625d7b082909.

37. As confirmation, an article from Variety states that "Netflix has been using H.264/AVC almost exclusively" and "That's why Netflix is also encoding its downloadable videos with a different flavor of H.264/AVC, which is also known as a different profile. (For the technically inclined: Netflix's streams are encoded with **H.264/AVC Main,** whereas its downloads come in **H.264/AVC High**. The company shared more details on its tech blog this week.) This isn't quite as effective as using VP9, but still allows Netflix to shave off some bits." *See* Janko Roettgers, *Variety*, December 2, 2016, "How Netflix Delivers Better-Looking Downloads Without Eating Up All Your Phone Storage," http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/.

38. In another entry of Netflix's "The Netflix Tech Blog," a test comparing several different encoders was described: "H.264/AVC is a very widely-used video compression standard on the Internet, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. **x264** is the most established open-source software encoder for H.264/AVC…**x265** is an open-source HEVC encoder, originally ported from the x264 codebase. Concurrent to HEVC, Google developed VP9 as a royalty-free video compression format and released **libvpx** as an open-source software library for encoding VP9." *See* https://medium.com/netflix-techblog/a-large-scale-comparison-of-x264-x265-and-libvpx-a-sneak-peek-2e81e88f8b0f.

39. The Accused Instrumentalities determine a parameter of at least a portion of a video data block. As shown below, examples of such parameters include bitrate (or max video bitrate) and resolution parameters. Different

parameters correspond with different end applications. H.264 provides for multiple different ranges of such parameters, each included in the "profiles" and "levels" as defined by the H.264 standard, from the below shown paragraphs from a white paper and Wikipedia. *See* http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5:

> **4. H.264 profiles and levels**
>
> The joint group involved in defining H.264 focused on creating a simple and clean solution, limiting options and features to a minimum. An important aspect of the standard, as with other video standards, is providing the capabilities in profiles (sets of algorithmic features) and levels (performance classes) that optimally support popular productions and common formats.
>
> H.264 has seven profiles, each targeting a specific class of applications. Each profile defines what feature set the encoder may use and limits the decoder implementation complexity.
>
> Network cameras and video encoders will most likely use a profile called the baseline profile, which is intended primarily for applications with limited computing resources. The baseline profile is the most suitable given the available performance in a real-time encoder that is embedded in a network video product. The profile also enables low latency, which is an important requirement of surveillance video and also particularly important in enabling real-time, pan/tilt/zoom (PTZ) control in PTZ network cameras.
>
> H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements. Each level defines the bit rate and the encoding rate in macroblock per second for resolutions ranging from QCIF to HDTV and beyond. The higher the resolution, the higher the level required.

See https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Levels with maximum property values

Level	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s			Examples for high resolution @ highest frame rate (max stored frames) Toggle additional details
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile	
1	380,160	1,485	25,344	99	64	80	192	176×144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176×144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352×288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352×288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352×288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352×288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352×576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720×576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720×576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280×720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280×1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048×1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048×1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048×1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672×1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@56.3 (5)

40. A video data block is organized by the group of pictures (GOP)

structure, which is a "collection of successive pictures within a coded video stream." *See* https://en.wikipedia.org/wiki/Group_of_pictures. A GOP structure can contain intra coded pictures (I picture or I frame), predictive coded pictures (P picture or P frame), bipredictive coded pictures (B picture or B frame) and direct coded pictures (D picture or D frames, or DC direct coded pictures which are used only in MPEG-1 video). *See* https://en.wikipedia.org/wiki/Video_compression_picture_types (for descriptions of I frames, P frames and B frames); https://en.wikipedia.org/wiki/MPEG-1#D-frames (for descriptions of D frames). Thus, at least a portion of a video data block would also make up a GOP structure and could also contain I frames, P frames, B frames and/or D frames. The GOP structure also reflects the size of a video data block, and the GOP structure can be controlled and used to fine-tune other parameters (e.g. bitrate, max video bitrate and resolution parameters) or even be considered as a parameter by itself.

41. Based on the bitrate and/or resolution parameter identified (e.g. bitrate, max video bitrate, resolution, GOP structure or frame type within a GOP structure), any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., "baseline," "extended," "main", or "high") corresponds with that parameter, then select between at least two asymmetric compressors. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding ("CAVLC") entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding ("CABAC") entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8×8 vs. 4×4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	**Static** - Probabilities never change	**Adaptive** - Adjusts probabilities based on actual data
• Leverages correlation between symbols	**No** - Conditional probabilities ignored	**Yes** - Exploits symbol correlations by using "contexts"
• Non-integer code words	**No** - Low coding efficiency forhigh probability symbols	**Yes** - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. *See* https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

> **entropy_coding_mode_flag** selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:
>
> – If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
>
> – Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

42. The Accused Instrumentalities compress the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks, which can be organized in a GOP structure (see above). After its selection, the asymmetric compressor (CAVLC or CABAC) will compress the video data to provide various compressed data blocks, which can also be organized in a GOP structure, as discussed previously above. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

> **Entropy Coding**
> For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may requires a 30-40% of total processing power to be accomplished.

See

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf at 13:

> Typical compression ratios to maintain excellent quality are:
> - 10:1 for general images using JPEG
> - 30:1 for general video using H.263 and MPEG-2
> - 60:1 for general video using H.264 and WMV9

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

> Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.
>
> The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.
>
> The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.
>
> The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

43. Therefore, from at least the above, Netflix has directly infringed and continues to infringe the '535 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the system claimed by Claim 1 of the '535 patent, namely, a method, comprising: determining a parameter or attribute of at least a portion of a data block having audio or video data; selecting an access profile from among a plurality of access profiles based upon the determined parameter or attribute; and compressing the at least the portion of the data block with one or more compressors using asymmetric data compression and information from the selected access profile to create one or more compressed data blocks, the information being indicative of the one or more compressors to apply to the at least the portion of the data block. Upon information and belief, Netflix uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair

services for the Accused Instrumentalities to their customers.

44. On information and belief, the Accused Instrumentalities store at least a portion of the one or more compressed data blocks in buffers, hard disk, or other forms of memory/storage.

45. On information and belief, Netflix also directly infringes and continues to infringe other claims of the '535 patent.

46. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, e.g., in the manner specified in the H.264 standard.

47. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the systems and/or methods claimed by the '535 patent.

48. On information and belief, Netflix has had knowledge of the '535 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Netflix knew of the '535 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Netflix will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '535 patent.

49. Upon information and belief, Netflix's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '535 patent by practicing a method, comprising: determining a parameter of at least a portion of a data block; determining a parameter or attribute of at least a portion of a data block having audio or video data; selecting an access profile from among a plurality of access

profiles based upon the determined parameter or attribute; and compressing the at least the portion of the data block with one or more compressors using asymmetric data compression and information from the selected access profile to create one or more compressed data blocks, the information being indicative of the one or more compressors to apply to the at least the portion of the data block. For example, Netflix adopted H.264 as its video codec in its products/services, such as its streaming services, and uses H.264 as an encoder, encode or codec. For similar reasons, Netflix also induces its customers to use the Accused Instrumentalities to infringe other claims of the '535 patent. Netflix specifically intended and was aware that these normal and customary activities would infringe the '535 patent. Netflix performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '535 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Netflix engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Netflix has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '535 patent, knowing that such use constitutes infringement of the '535 patent. Accordingly, Netflix has been, and currently is, inducing infringement of the '535 patent, in violation of 35 U.S.C. § 271(b).

50. Netflix has also infringed, and continues to infringe, claims of the '535 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '535 patent, and constitute a material part of the invention. Netflix knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '535 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Netflix has

been, and currently is, contributorily infringing the '535 patent, in violation of 35 U.S.C. § 271(c).

51. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Netflix has injured Realtime and is liable to Realtime for infringement of the '535 patent pursuant to 35 U.S.C. § 271.

52. As a result of Netflix's infringement of the '535 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Netflix's infringement, but in no event less than a reasonable royalty for the use made of the invention by Netflix, together with interest and costs as fixed by the Court.

COUNT III

INFRINGEMENT OF U.S. PATENT NO. 8,054,879

53. Plaintiff re-alleges and incorporates by reference the foregoing paragraphs, as if fully set forth herein.

54. On information and belief, Netflix has made, used, offered for sale, sold and/or imported into the United States Netflix products that infringe the '879 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Netflix's streaming video service; Netflix's video encoders or codecs including x264, x265 and libvpx; and Netflix's mobile encoders, encoders or codecs including AVCMain (H.264/AVC Main), H.264/AVC High, VP9, AVCHi-Mobile and VP9-Mobile, and all versions and variations thereof since the issuance of the '879 patent ("Accused Instrumentalities").

55. For example, an official website from Netflix known as "The Netflix Tech Blog" states that Netflix is "introducing two new types of mobile encodes – **AVCHi-Mobile and VP9-Mobile**…All the changes combined result in better

video quality for the same bitrate compared to our current streams (**AVCMain**). Many Netflix-ready devices receive streams which are encoded using the **H.264/AVC Main profile (AVCMain)**. This is a widely-used video compression format, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. However, newer formats are available that offer more sophisticated video coding tools. For our mobile bitstreams we adopt two compression formats: **H.264/AVC High profile and VP9 (profile 0)**. Similar to Main profile, **the High profile of H.264/AVC** enjoys broad decoder support. **VP9**, a royalty-free format developed by Google, is supported on the majority of Android devices, Chrome, and a growing number of consumer devices." (emphasis added). *See* https://medium.com/netflix-techblog/more-efficient-mobile-encodes-for-netflix-downloads-625d7b082909.

56. As confirmation, an article from Variety states that "Netflix has been using H.264/AVC almost exclusively" and "That's why Netflix is also encoding its downloadable videos with a different flavor of H.264/AVC, which is also known as a different profile. (For the technically inclined: Netflix's streams are encoded with **H.264/AVC Main,** whereas its downloads come in **H.264/AVC High**. The company shared more details on its tech blog this week.) This isn't quite as effective as using VP9, but still allows Netflix to shave off some bits." *See* Janko Roettgers, *Variety*, December 2, 2016, "How Netflix Delivers Better-Looking Downloads Without Eating Up All Your Phone Storage," http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/.

57. In another entry of Netflix's "The Netflix Tech Blog," a test comparing several different encoders was described: "H.264/AVC is a very widely-used video compression standard on the Internet, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. **x264** is the most established open-source software encoder for H.264/AVC…**x265** is an

open-source HEVC encoder, originally ported from the x264 codebase. Concurrent to HEVC, Google developed VP9 as a royalty-free video compression format and released **libvpx** as an open-source software library for encoding VP9." *See* https://medium.com/netflix-techblog/a-large-scale-comparison-of-x264-x265-and-libvpx-a-sneak-peek-2e81e88f8b0f.

58. The Accused Instrumentalities receive a data block and determine a data type associated with the received data block. Examples of data type include whether the data block is a video data block, as well as other data types. The Accused Instrumentalities select an access profile from a plurality of access profiles based, at least in part, on a number of times in which the determined data type is written to a storage device relative to a number of times that the determined data type is read from the storage device. For example, a video data type, as well as other data types, are associated with a number of times in which the data type is written to a storage device relative to a number of times that the data type is read from the storage device. The Accused Instrumentalities retrieve information from the selected access profile, wherein said information comprises a compression parameter. As shown below, examples of such parameters include bitrate (or max video bitrate) and resolution parameters, as well as other parameters. Different parameters correspond with different end applications. H.264 provides for multiple different ranges of such parameters, each included in the "profiles" and "levels" as defined by the H.264 standard, from the below shown paragraphs from a white paper and Wikipedia. *See* http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5:

See https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Levels with maximum property values

Level	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s			Examples for high resolution @ highest frame rate (max stored frames) Toggle additional details
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile	
1	380,160	1,485	25,344	99	64	80	192	176×144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176×144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352×288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352×288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352×288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352×288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352×576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720×576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720×576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280×720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280×1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048×1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048×1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048×1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672×1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@56.3 (5)

59. A video data block is organized by the group of pictures (GOP) structure, which is a "collection of successive pictures within a coded video stream." *See* https://en.wikipedia.org/wiki/Group_of_pictures. A GOP structure can contain intra coded pictures (I picture or I frame), predictive coded pictures (P picture or P frame), bipredictive coded pictures (B picture or B frame) and direct coded pictures (D picture or D frames, or DC direct coded pictures which are used only in MPEG-1 video). *See* https://en.wikipedia.org/wiki/Video_compression_picture_types (for descriptions of I frames, P frames and B frames); https://en.wikipedia.org/wiki/MPEG-1#D-frames (for descriptions of D frames). Thus, at least a portion of a video data block would also make up a GOP structure and could also contain I frames, P frames, B frames and/or D frames. The GOP structure also reflects the size of a video data block, and the GOP structure can be controlled and used to fine-tune other parameters (e.g. bitrate, max video bitrate and resolution parameters) or even be considered as a parameter by itself.

60. Based on the bitrate and/or resolution parameter identified (e.g. bitrate, max video bitrate, resolution, GOP structure or frame type within a GOP structure), any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., "baseline," "extended," "main", or "high") corresponds with that parameter, then select between or among compressors. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding ("CAVLC") entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding ("CABAC") entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf at 7:

The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.

H.264 Entropy Coding – Comparison of Approaches

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	**Static** - Probabilities never change	**Adaptive** - Adjusts probabilities based on actual data
• Leverages correlation between symbols	**No** - Conditional probabilities ignored	**Yes** - Exploits symbol correlations by using "contexts"
• Non-integer code words	**No** - Low coding efficiency forhigh probability symbols	**Yes** - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. *See*

https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

61. The Accused Instrumentalities compress said data block, to provide a compressed data block, based, at least in part, on said compression parameter, which can be organized in a GOP structure (see above). After its selection, the compressor (CAVLC or CABAC) will compress the video data to provide various compressed data blocks, which can also be organized in a GOP structure, as discussed previously above. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

Entropy Coding

For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may requires a 30-40% of total processing power to be accomplished.

See

http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf at 13:

Typical compression ratios to maintain excellent quality are:

- 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 60:1 for general video using H.264 and WMV9

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

62. Therefore, from at least the above, Netflix has directly infringed and continues to infringe the '879 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the method claimed

Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.

The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.

The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.

The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

by Claim 1 of the '879 patent, namely, a method comprising: receiving a data block; determining a data type associated with the received data block; selecting an access profile from a plurality of access profiles based, at least in part, on a number of times in which the determined data type is written to a storage device relative to a number of times that the determined data type is read from the storage device; retrieving information from the selected access profile, wherein said information comprises a compression parameter; and compressing said data block, to provide a compressed data block, based, at least in part, on said compression parameter. Upon information and belief, Netflix uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair

services for the Accused Instrumentalities to their customers.

63. On information and belief, the Accused Instrumentalities store at least a portion of the one or more compressed data blocks in buffers, hard disk, or other forms of memory/storage.

64. On information and belief, Netflix also directly infringes and continues to infringe other claims of the '879 patent.

65. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, e.g., in the manner specified in the H.264 standard.

66. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the systems and/or methods claimed by the '879 patent.

67. On information and belief, Netflix has had knowledge of the '879 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Netflix knew of the '879 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Netflix will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '879 patent.

68. Upon information and belief, Netflix's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '879 patent by practicing a method comprising: receiving a data block; determining a data type associated with the received data block; selecting an access profile from a plurality of access profiles based, at least in part, on a number of times in which the determined data

type is written to a storage device relative to a number of times that the determined data type is read from the storage device; retrieving information from the selected access profile, wherein said information comprises a compression parameter; and compressing said data block, to provide a compressed data block, based, at least in part, on said compression parameter. For example, Netflix adopted H.264 as its video codec in its products/services, such as its streaming services, and uses H.264 as an encoder, encode or codec. For similar reasons, Netflix also induces its customers to use the Accused Instrumentalities to infringe other claims of the '879 patent. Netflix specifically intended and was aware that these normal and customary activities would infringe the '879 patent. Netflix performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '879 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Netflix engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Netflix has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '879 patent, knowing that such use constitutes infringement of the '879 patent. Accordingly, Netflix has been, and currently is, inducing infringement of the '879 patent, in violation of 35 U.S.C. § 271(b).

69. Netflix has also infringed, and continues to infringe, claims of the '879 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '879 patent, and constitute a material part of the invention. Netflix knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '879 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Netflix has

been, and currently is, contributorily infringing the '879 patent, in violation of 35 U.S.C. § 271(c).

70. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Netflix has injured Realtime and is liable to Realtime for infringement of the '879 patent pursuant to 35 U.S.C. § 271.

71. As a result of Netflix's infringement of the '879 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Netflix's infringement, but in no event less than a reasonable royalty for the use made of the invention by Netflix, together with interest and costs as fixed by the Court.

COUNT IV

INFRINGEMENT OF U.S. PATENT NO. 9,769,477

72. Plaintiff re-alleges and incorporates by reference the foregoing paragraphs, as if fully set forth herein.

73. On information and belief, Netflix has made, used, offered for sale, sold and/or imported into the United States Netflix products that infringe the '477 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Netflix's streaming video service; Netflix's video encoders or codecs including x264, x265 and libvpx; and Netflix's mobile encoders, encoders or codecs including AVCMain (H.264/AVC Main), H.264/AVC High, VP9, AVCHi-Mobile and VP9-Mobile, and all versions and variations thereof since the issuance of the '477 patent ("Accused Instrumentalities").

74. For example, an official website from Netflix known as "The Netflix Tech Blog" states that Netflix is "introducing two new types of mobile encodes – **AVCHi-Mobile and VP9-Mobile**…All the changes combined result in better

video quality for the same bitrate compared to our current streams (**AVCMain**). Many Netflix-ready devices receive streams which are encoded using the **H.264/AVC Main profile (AVCMain**). This is a widely-used video compression format, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. However, newer formats are available that offer more sophisticated video coding tools. For our mobile bitstreams we adopt two compression formats: **H.264/AVC High profile and VP9 (profile 0)**. Similar to Main profile, **the High profile of H.264/AVC** enjoys broad decoder support. **VP9**, a royalty-free format developed by Google, is supported on the majority of Android devices, Chrome, and a growing number of consumer devices." (emphasis added). *See* https://medium.com/netflix-techblog/more-efficient-mobile-encodes-for-netflix-downloads-625d7b082909.

75. As confirmation, an article from Variety states that "Netflix has been using H.264/AVC almost exclusively" and "That's why Netflix is also encoding its downloadable videos with a different flavor of H.264/AVC, which is also known as a different profile. (For the technically inclined: Netflix's streams are encoded with **H.264/AVC Main,** whereas its downloads come in **H.264/AVC High**. The company shared more details on its tech blog this week.) This isn't quite as effective as using VP9, but still allows Netflix to shave off some bits." *See* Janko Roettgers, *Variety*, December 2, 2016, "How Netflix Delivers Better-Looking Downloads Without Eating Up All Your Phone Storage," http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/.

76. In another entry of Netflix's "The Netflix Tech Blog," a test comparing several different encoders was described: "H.264/AVC is a very widely-used video compression standard on the Internet, with ubiquitous decoder support on web browsers, TVs, mobile devices, and other consumer devices. **x264** is the most established open-source software encoder for H.264/AVC…**x265** is an

open-source HEVC encoder, originally ported from the x264 codebase. Concurrent to HEVC, Google developed VP9 as a royalty-free video compression format and released **libvpx** as an open-source software library for encoding VP9." *See* https://medium.com/netflix-techblog/a-large-scale-comparison-of-x264-x265-and-libvpx-a-sneak-peek-2e81e88f8b0f.

The Accused Instrumentalities determine a parameter of at least a portion of a

4. H.264 profiles and levels

The joint group involved in defining H.264 focused on creating a simple and clean solution, limiting options and features to a minimum. An important aspect of the standard, as with other video standards, is providing the capabilities in profiles (sets of algorithmic features) and levels (performance classes) that optimally support popular productions and common formats.

H.264 has seven profiles, each targeting a specific class of applications. Each profile defines what feature set the encoder may use and limits the decoder implementation complexity.

Network cameras and video encoders will most likely use a profile called the baseline profile, which is intended primarily for applications with limited computing resources. The baseline profile is the most suitable given the available performance in a real-time encoder that is embedded in a network video product. The profile also enables low latency, which is an important requirement of surveillance video and also particularly important in enabling real-time, pan/tilt/zoom (PTZ) control in PTZ network cameras.

H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements. Each level defines the bit rate and the encoding rate in macroblock per second for resolutions ranging from QCIF to HDTV and beyond. The higher the resolution, the higher the level required.

video data block. As shown below, examples of such parameters include bitrate (or max video bitrate) and resolution parameters. Different parameters correspond with different end applications. H.264 provides for multiple different ranges of such parameters, each included in the "profiles" and "levels" as defined by the H.264 standard, from the below shown paragraphs from a white paper and Wikipedia. *See* http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf at 5: *See* https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC:

Levels with maximum property values

Level	Max decoding speed		Max frame size		Max video bit rate for video coding layer (VCL) kbit/s			Examples for high resolution @ highest frame rate (max stored frames) Toggle additional details
	Luma samples/s	Macroblocks/s	Luma samples	Macroblocks	Baseline, Extended and Main Profiles	High Profile	High 10 Profile	
1	380,160	1,485	25,344	99	64	80	192	176×144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176×144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352×288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352×288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352×288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352×288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352×576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720×576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720×576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280×720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280×1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048×1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048×1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048×1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672×1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096×2,304@56.3 (5)

77. A video data block is organized by the group of pictures (GOP) structure, which is a "collection of successive pictures within a coded video stream." *See* https://en.wikipedia.org/wiki/Group_of_pictures. A GOP structure can contain intra coded pictures (I picture or I frame), predictive coded pictures (P picture or P frame), bipredictive coded pictures (B picture or B frame) and direct coded pictures (D picture or D frames, or DC direct coded pictures which are used only in MPEG-1 video). *See* https://en.wikipedia.org/wiki/Video_compression_picture_types (for descriptions of I frames, P frames and B frames); https://en.wikipedia.org/wiki/MPEG-1#D-frames (for descriptions of D frames). Thus, at least a portion of a video data block would also make up a GOP structure and could also contain I frames, P frames, B frames and/or D frames. The GOP structure also reflects the size of a video data block, and the GOP structure can be controlled and used to fine-tune other parameters (e.g. bitrate, max video bitrate and resolution parameters) or even be considered as a parameter by itself.

78. Based on the bitrate and/or resolution parameter identified (e.g. bitrate, max video bitrate, resolution, GOP structure or frame type within a GOP structure), any H.264-compliant system such as the Accused Instrumentalities would determine which profile (e.g., "baseline," "extended," "main", or "high")

corresponds with that parameter, then select between at least two asymmetric compressors. If baseline or extended is the corresponding profile, then the system will select a Context-Adaptive Variable Length Coding ("CAVLC") entropy encoder. If main or high is the corresponding profile, then the system will select a Context-Adaptive Binary Arithmetic Coding ("CABAC") entropy encoder. Both encoders are asymmetric compressors because it takes a longer period of time for them to compress data than to decompress data. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

> The following table summarizes the two major types of entropy coding: Variable Length Coding (VLC) and Context Adaptive Binary Arithmetic Coding (CABAC). CABAC offers superior coding efficiency over VLC by adapting to the changing probability distribution of symbols, by exploiting correlation between symbols, and by adaptively exploiting bit correlations using arithmetic coding. H.264 also supports Context Adaptive Variable Length Coding (CAVLC) which offers superior entropy coding over VLC without the full cost of CABAC.
>
> **H.264 Entropy Coding – Comparison of Approaches**

Characteristics	Variable Length Coding (VLC)	Context Adaptive Binary Arithmetic Coding(CABAC)
• Where it is used	MPEG-2, MPEG-4 ASP	H.264/MPEG-4 AVC (high efficiency option)
• Probability distribution	**Static** - Probabilities never change	**Adaptive** - Adjusts probabilities based on actual data
• Leverages correlation between symbols	**No** - Conditional probabilities ignored	**Yes** - Exploits symbol correlations by using "contexts"
• Non-integer code words	**No** - Low coding efficiency forhigh probability symbols	**Yes** - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

See http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf at 7:

	Baseline	Extended	Main	High	High 10
I and P Slices	Yes	Yes	Yes	Yes	Yes
B Slices	No	Yes	Yes	Yes	Yes
SI and SP Slices	No	Yes	No	No	No
Multiple Reference Frames	Yes	Yes	Yes	Yes	Yes
In-Loop Deblocking Filter	Yes	Yes	Yes	Yes	Yes
CAVLC Entropy Coding	Yes	Yes	Yes	Yes	Yes
CABAC Entropy Coding	No	No	Yes	Yes	Yes
Flexible Macroblock Ordering (FMO)	Yes	Yes	No	No	No
Arbitrary Slice Ordering (ASO)	Yes	Yes	No	No	No
Redundant Slices (RS)	Yes	Yes	No	No	No
Data Partitioning	No	Yes	No	No	No
Interlaced Coding (PicAFF, MBAFF)	No	Yes	Yes	Yes	Yes
4:2:0 Chroma Format	Yes	Yes	Yes	Yes	Yes
Monochrome Video Format (4:0:0)	No	No	No	Yes	Yes
4:2:2 Chroma Format	No	No	No	No	No
4:4:4 Chroma Format	No	No	No	No	No
8 Bit Sample Depth	Yes	Yes	Yes	Yes	Yes
9 and 10 Bit Sample Depth	No	No	No	No	Yes
11 to 14 Bit Sample Depth	No	No	No	No	No
8×8 vs. 4×4 Transform Adaptivity	No	No	No	Yes	Yes
Quantization Scaling Matrices	No	No	No	Yes	Yes
Separate Cb and Cr QP control	No	No	No	Yes	Yes
Separate Color Plane Coding	No	No	No	No	No
Predictive Lossless Coding	No	No	No	No	No

Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to determine the correct decoder for the corresponding encoder. As shown below, if the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1, then CABAC must have been selected as the encoder. *See* https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items (Rec. ITU-T H.264 (04/2013)) at 80:

> **entropy_coding_mode_flag** selects the entropy decoding method to be applied for the syntax elements for which two descriptors appear in the syntax tables as follows:
>
> – If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
>
> – Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

79. The Accused Instrumentalities compress the at least the portion of the data block with the selected one or more asymmetric compressors to provide one or more compressed data blocks, which can be organized in a GOP structure (see above). After its selection, the asymmetric compressor (CAVLC or CABAC) will

compress the video data to provide various compressed data blocks, which can also be organized in a GOP structure, as discussed previously above. *See* https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/:

> **Entropy Coding**
> For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic coding (CABAC) which are complex techniques to losslessly compress syntax elements in the video stream knowing the probabilities of syntax elements in a given context. The use of CABAC can improve the compression of around 5-7%. CABAC may requires a 30-40% of total processing power to be accomplished.

See http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf at 13:

> Typical compression ratios to maintain excellent quality are:
> - 10:1 for general images using JPEG
> - 30:1 for general video using H.263 and MPEG-2
> - 60:1 for general video using H.264 and WMV9

See http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf at 2:

> Most visual communication systems today use Baseline Profile. Baseline is the simplest H.264 profile and defines, for example, zigzag scanning of the picture and using 4:2:0 (YUV video formats) chrominance sampling. In Baseline Profile, the picture is split in blocks consisting of 4x4 pixels, and each block is processed separately. Another important element of the Baseline Profile is the use of Universal Variable Length Coding (UVLC) and Context Adaptive Variable Length Coding (CAVLC) entropy coding techniques.
>
> The Extended and Main Profiles includes the functionality of the Baseline Profile and add improvements to the predictions algorithms. Since transmitting every single frame (think 30 frames per second for good quality video) is not feasible if you are trying to reduce the bit rate 1000-2000 times, temporal and motion prediction are heavily used in H.264, and allow transmitting only the difference between one frame and the previous frames. The result is spectacular efficiency gain, especially for scenes with little change and motion.
>
> The High Profile is the most powerful profile in H.264, and it allows most efficient coding of video. For example, large coding gain achieved through the use of Context Adaptive Binary Arithmetic Coding (CABAC) encoding which is more efficient than the UVLC/CAVLC used in Baseline Profile.
>
> The High Profile also uses adaptive transform that decides on the fly if 4x4 or 8x8-pixel blocks should be used. For example, 4x4 blocks are used for the parts of the picture that are dense with detail, while parts that have little detail are transformed using 8x8 blocks.

80. Therefore, from at least the above, Netflix has directly infringed and

continues to infringe the '477 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the system claimed by Claim 1 of the '477 patent, namely, a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms, and wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders; and one or more processors configured to: determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second; and select one or more asymmetric data compression encoders from among the plurality of different asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters. Upon information and belief, Netflix uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to their customers.

81. On information and belief, the Accused Instrumentalities store at least a portion of the one or more compressed data blocks in buffers, hard disk, or other forms of memory/storage.

82. On information and belief, Netflix also directly infringes and continues to infringe other claims of the '477 patent.

83. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, e.g., in the manner specified in the H.264 standard.

84. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the systems and/or methods claimed by the '477 patent.

85. On information and belief, Netflix has had knowledge of the '477 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Netflix knew of the '477 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Netflix will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '477 patent.

86. Upon information and belief, Netflix's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '477 patent by practicing a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms, and wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders; and one or more processors configured to: determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second; and select one or more asymmetric data compression encoders from among the plurality of different

asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters. For example, Netflix adopted H.264 as its video codec in its products/services, such as its streaming services, and uses H.264 as an encoder, encode or codec. For similar reasons, Netflix also induces its customers to use the Accused Instrumentalities to infringe other claims of the '477 patent. Netflix specifically intended and was aware that these normal and customary activities would infringe the '477 patent. Netflix performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '477 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Netflix engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Netflix has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '477 patent, knowing that such use constitutes infringement of the '477 patent. Accordingly, Netflix has been, and currently is, inducing infringement of the '477 patent, in violation of 35 U.S.C. § 271(b).

87. Netflix has also infringed, and continues to infringe, claims of the '477 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '477 patent, and constitute a material part of the invention. Netflix knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '477 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Netflix has been, and currently is, contributorily infringing the '477 patent, in violation of 35 U.S.C. § 271(c).

88. By making, using, offering for sale, selling and/or importing into the

United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Netflix has injured Realtime and is liable to Realtime for infringement of the '477 patent pursuant to 35 U.S.C. § 271.

89. As a result of Netflix's infringement of the '477 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Netflix's infringement, but in no event less than a reasonable royalty for the use made of the invention by Netflix, together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Realtime respectfully requests that this Court enter:

a. A judgment in favor of Plaintiff that Netflix has infringed, literally and/or under the doctrine of equivalents, the '046, '535, '879, and '477 patents (the "asserted patents" or "patents-in-suit");

b. A judgment and order requiring Netflix to pay Plaintiff its damages, costs, expenses, and prejudgment and post-judgment interest for its infringement of the asserted patents, as provided under 35 U.S.C. § 284;

c. A judgment and order requiring Netflix to provide an accounting and to pay supplemental damages to Realtime, including without limitation, prejudgment and post-judgment interest;

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

e. Any and all other relief as the Court may deem appropriate and just

under the circumstances.

DEMAND FOR JURY TRIAL

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

Respectfully submitted,

DATED: September 20, 2019

RUSS, AUGUST & KABAT

By: /s/ *Reza Mirzaie*

Marc A. Fenster (CA SBN 181067)
Email: mfenster@raklaw.com
Brian D. Ledahl (CA SBN 186579)
Email: bledahl@raklaw.com
Reza Mirzaie (CA SBN 246953)
Email: rmirzaie@raklaw.com
Paul Kroeger (CA SBN 229074)
Email: pkroeger@raklaw.com
C. Jay Chung (CA SBN 252794)
Email: jchung@raklaw.com
Philip X. Wang (CA SBN 262239)
Email: pwang@raklaw.com
12424 Wilshire Boulevard, 12th Floor
Los Angeles, CA 90025
Telephone: 310/826-7474
Facsimile 310/826-6991

Attorneys for Plaintiff
Realtime Adaptive Streaming LLC