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 11 *REALTIME ADAPTIVE STREAMING LLC*

12  
 13 **UNITED STATES DISTRICT COURT**  
 14 **CENTRAL DISTRICT OF CALIFORNIA**  
 15 **WESTERN DIVISION**

16  
 17 REALTIME ADAPTIVE  
 STREAMING LLC,  
 18  
 Plaintiff,  
 19  
 v.  
 20 NETFLIX, INC. and  
 21 NETFLIX STREAMING  
 SERVICES, INC.,  
 22  
 Defendants.  
 23

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

**FIRST AMENDED COMPLAINT**  
**FOR PATENT INFRINGEMENT**

**JURY TRIAL DEMANDED**

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

6 **PARTIES**

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

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

18 3. Defendant Netflix Streaming Services, Inc. is a Delaware corporation,  
19 with its principal place of business at 100 Winchester Circle, Los Gatos, California  
20 95032. Netflix Streaming Services, Inc. may be served with process by serving its  
21 registered agent, The Corporation Trust Company at the Corporation Trust Center,  
22 1209 Orange Street, Wilmington, Delaware 19801.

23 4. Defendants have regular and established place of business in this  
24 District, including, e.g., in Los Angeles, CA. *See, e.g.,*  
25 <https://jobs.netflix.com/locations/los-angeles-california>  
26  
27  
28

**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

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1 13, 2015. A copy of the '535 patent is attached hereto as **Exhibit B** Realtime is the  
2 owner and assignee of the '535 patent and holds the right to sue for and recover all  
3 damages for infringement thereof, including past infringement.

4 11. The '879 patent, titled "Bandwidth Sensitive Data Compression and  
5 Decompression," was duly and properly issued by the USPTO on November 8,  
6 2011. A copy of the '879 patent is attached hereto as **Exhibit C**. Realtime is the  
7 owner and assignee of the '879 patent and holds the right to sue for and recover all  
8 damages for infringement thereof, including past infringement.

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

14 **COUNT I**

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

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

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

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

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

14 16. As confirmation, an article from Variety states that “Netflix has been  
15 using H.264/AVC almost exclusively” and “That’s why Netflix is also encoding its  
16 downloadable videos with a different flavor of H.264/AVC, which is also known  
17 as a different profile. (For the technically inclined: Netflix’s streams are encoded  
18 with **H.264/AVC Main**, whereas its downloads come in **H.264/AVC High**. The  
19 company shared more details on its tech blog this week.) This isn’t quite as  
20 effective as using VP9, but still allows Netflix to shave off some bits.” See Janko  
21 Roettgers, *Variety*, December 2, 2016, “How Netflix Delivers Better-Looking  
22 Downloads Without Eating Up All Your Phone Storage,”  
23 [http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/)  
24 [1201932502/](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/).

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

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

7 18. The Accused Instrumentalities determine a parameter of at least a  
 8 portion of a video data block. As shown below, examples of such parameters  
 9 include bitrate (or max video bitrate) and resolution parameters. Different  
 10 parameters correspond with different end applications. H.264 provides for  
 11 multiple different ranges of such parameters, each included in the “profiles” and  
 12 “levels” as defined by the H.264 standard, from the below shown paragraphs from  
 13 a white paper and Wikipedia. *See*  
 14 [http://www.axis.com/files/whitepaper/wp\\_h264\\_31669\\_en\\_0803\\_lo.pdf](http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf) at 5:

#### 15 4. H.264 profiles and levels

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

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

21 Network cameras and video encoders will most likely use a profile called the baseline profile, which is  
 22 intended primarily for applications with limited computing resources. The baseline profile is the most  
 23 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.

24 H.264 has 11 levels or degree of capability to limit performance, bandwidth and memory requirements.  
 25 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.

26 *See* [https://en.wikipedia.org/wiki/H.264/MPEG-4\\_AVC](https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC):  
 27  
 28

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) <a href="#">Toggle additional details</a>
	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	176x144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@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](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](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
8x8 vs. 4x4 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](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	<b>Static</b> - Probabilities never change	<b>Adaptive</b> - Adjusts probabilities based on actual data
• Leverages correlation between symbols	<b>No</b> - Conditional probabilities ignored	<b>Yes</b> - Exploits symbol correlations by using "contexts"
• Non-integer code words	<b>No</b> - Low coding efficiency for high probability symbols	<b>Yes</b> - 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](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

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

#### 4 **Entropy Coding**

5 For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive  
 6 variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic  
 7 coding (CABAC) which are complex techniques to losslessly compress syntax elements in the  
 8 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.

9 See

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

11 Typical compression ratios to maintain excellent quality are:

- 12 • 10:1 for general images using JPEG
- 13 • 30:1 for general video using H.263 and MPEG-2
- 14 • 60:1 for general video using H.264 and WMV9

15 See [http://www.ijera.com/papers/Vol3\\_issue4/BM34399403.pdf](http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf) at 2:

16 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.

17 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.

18 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.

19 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.

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

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

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

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

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

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

1 methods claimed by the '046 patent.

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

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

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

13 31. Netflix has also infringed, and continues to infringe, claims of the  
14 '046 patent by offering to commercially distribute, commercially distributing,  
15 making, and/or importing the Accused Instrumentalities, which are used in  
16 practicing the process, or using the systems, of the '046 patent, and constitute a  
17 material part of the invention. Netflix knows the components in the Accused  
18 Instrumentalities to be especially made or especially adapted for use in  
19 infringement of the '046 patent, not a staple article, and not a commodity of  
20 commerce suitable for substantial noninfringing use. Accordingly, Netflix has  
21 been, and currently is, contributorily infringing the '046 patent, in violation of 35  
22 U.S.C. § 271(c).

23 32. By making, using, offering for sale, selling and/or importing into the  
24 United States the Accused Instrumentalities, and touting the benefits of using the  
25 Accused Instrumentalities' compression features, Netflix has injured Realtime and  
26 is liable to Realtime for infringement of the '046 patent pursuant to 35 U.S.C. §  
27 271.

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

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

## 5 **COUNT II**

### 6 **INFRINGEMENT OF U.S. PATENT NO. 8,934,535**

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

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

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

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

5 37. As confirmation, an article from Variety states that “Netflix has been  
6 using H.264/AVC almost exclusively” and “That’s why Netflix is also encoding its  
7 downloadable videos with a different flavor of H.264/AVC, which is also known  
8 as a different profile. (For the technically inclined: Netflix’s streams are encoded  
9 with **H.264/AVC Main**, whereas its downloads come in **H.264/AVC High**. The  
10 company shared more details on its tech blog this week.) This isn’t quite as  
11 effective as using VP9, but still allows Netflix to shave off some bits.” See Janko  
12 Roettgers, *Variety*, December 2, 2016, “How Netflix Delivers Better-Looking  
13 Downloads Without Eating Up All Your Phone Storage,”  
14 [http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/)  
15 [1201932502/](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/).

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

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

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1 parameters correspond with different end applications. H.264 provides for  
 2 multiple different ranges of such parameters, each included in the “profiles” and  
 3 “levels” as defined by the H.264 standard, from the below shown paragraphs from  
 4 a white paper and Wikipedia. See  
 5 [http://www.axis.com/files/whitepaper/wp\\_h264\\_31669\\_en\\_0803\\_lo.pdf](http://www.axis.com/files/whitepaper/wp_h264_31669_en_0803_lo.pdf) at 5:

6 **4. H.264 profiles and levels**

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

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

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

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

21 See [https://en.wikipedia.org/wiki/H.264/MPEG-4\\_AVC](https://en.wikipedia.org/wiki/H.264/MPEG-4_AVC):

22 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) <input type="button" value="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	176x144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@56.3 (5)

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



1 structure, which is a “collection of successive pictures within a coded  
2 video stream.” See [https://en.wikipedia.org/wiki/Group\\_of\\_pictures](https://en.wikipedia.org/wiki/Group_of_pictures).  
3 A GOP structure can contain intra coded pictures (I picture or I  
4 frame), predictive coded pictures (P picture or P frame), bipredictive  
5 coded pictures (B picture or B frame) and direct coded pictures (D  
6 picture or D frames, or DC direct coded pictures which are used only  
7 in MPEG-1 video). See  
8 [https://en.wikipedia.org/wiki/Video\\_compression\\_picture\\_types](https://en.wikipedia.org/wiki/Video_compression_picture_types) (for  
9 descriptions of I frames, P frames and B frames);  
10 <https://en.wikipedia.org/wiki/MPEG-1#D-frames> (for descriptions of  
11 D frames). Thus, at least a portion of a video data block would also  
12 make up a GOP structure and could also contain I frames, P frames, B  
13 frames and/or D frames. The GOP structure also reflects the size of a  
14 video data block, and the GOP structure can be controlled and used to  
15 fine-tune other parameters (e.g. bitrate, max video bitrate and  
16 resolution parameters) or even be considered as a parameter by itself.

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

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	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
8x8 vs. 4x4 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](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	<b>Static</b> - Probabilities never change	<b>Adaptive</b> - Adjusts probabilities based on actual data
• Leverages correlation between symbols	<b>No</b> - Conditional probabilities ignored	<b>Yes</b> - Exploits symbol correlations by using "contexts"
• Non-integer code words	<b>No</b> - Low coding efficiency for high probability symbols	<b>Yes</b> - Exploits "arithmetic coding" which generates non-integer code words for higher efficiency

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

7           **entropy\_coding\_mode\_flag** selects the entropy decoding method to be applied for the syntax elements for which two  
 8 descriptors appear in the syntax tables as follows:

- 9           – 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).  
 10           – 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).

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

### 18           **Entropy Coding**

19           For entropy coding, H.264 may use an enhanced VLC, a more complex context-adaptive  
 20 variable-length coding (CAVLC) or an ever more complex Context-adaptive binary-arithmetic  
 21 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  
 22 processing power to be accomplished.

23           See

24           [http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep  
 =rep1&type=pdf](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep<br/>
  25 =rep1&type=pdf) at 13:

26           Typical compression ratios to maintain excellent quality are:

- 27           • 10:1 for general images using JPEG
- 30:1 for general video using H.263 and MPEG-2
- 28           • 60:1 for general video using H.264 and WMV9

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1 See [http://www.ijera.com/papers/Vol3\\_issue4/BM34399403.pdf](http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf) at 2:

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

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

24 The High Profile is the most powerful  
25 profile in H.264, and it allows most efficient coding  
26 of video. For example, large coding gain achieved  
27 through the use of Context Adaptive Binary  
28 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

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1 services for the Accused Instrumentalities to their customers.

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

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

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

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

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

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

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

21 50. Netflix has also infringed, and continues to infringe, claims of the  
22 '535 patent by offering to commercially distribute, commercially distributing,  
23 making, and/or importing the Accused Instrumentalities, which are used in  
24 practicing the process, or using the systems, of the '535 patent, and constitute a  
25 material part of the invention. Netflix knows the components in the Accused  
26 Instrumentalities to be especially made or especially adapted for use in  
27 infringement of the '535 patent, not a staple article, and not a commodity of  
28 commerce suitable for substantial noninfringing use. Accordingly, Netflix has

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

3 51. By making, using, offering for sale, selling and/or importing into the  
4 United States the Accused Instrumentalities, and touting the benefits of using the  
5 Accused Instrumentalities’ compression features, Netflix has injured Realtime and  
6 is liable to Realtime for infringement of the ‘535 patent pursuant to 35 U.S.C. §  
7 271.

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

### 13 **COUNT III**

#### 14 **INFRINGEMENT OF U.S. PATENT NO. 8,054,879**

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

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

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

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

13 56. As confirmation, an article from Variety states that “Netflix has been  
14 using H.264/AVC almost exclusively” and “That’s why Netflix is also encoding its  
15 downloadable videos with a different flavor of H.264/AVC, which is also known  
16 as a different profile. (For the technically inclined: Netflix’s streams are encoded  
17 with **H.264/AVC Main**, whereas its downloads come in **H.264/AVC High**. The  
18 company shared more details on its tech blog this week.) This isn’t quite as  
19 effective as using VP9, but still allows Netflix to shave off some bits.” See Janko  
20 Roettgers, *Variety*, December 2, 2016, “How Netflix Delivers Better-Looking  
21 Downloads Without Eating Up All Your Phone Storage,”  
22 [http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/)  
23 [1201932502/](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/).

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



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

6 58. The Accused Instrumentalities receive a data block and determine a  
7 data type associated with the received data block. Examples of data type include  
8 whether the data block is a video data block, as well as other data types. The  
9 Accused Instrumentalities select an access profile from a plurality of access  
10 profiles based, at least in part, on a number of times in which the determined data  
11 type is written to a storage device relative to a number of times that the determined  
12 data type is read from the storage device. For example, a video data type, as well as  
13 other data types, are associated with a number of times in which the data type is  
14 written to a storage device relative to a number of times that the data type is read  
15 from the storage device. The Accused Instrumentalities retrieve information from  
16 the selected access profile, wherein said information comprises a compression  
17 parameter. As shown below, examples of such parameters include bitrate (or max  
18 video bitrate) and resolution parameters, as well as other parameters. Different  
19 parameters correspond with different end applications. H.264 provides for  
20 multiple different ranges of such parameters, each included in the “profiles” and  
21 “levels” as defined by the H.264 standard, from the below shown paragraphs from  
22 a white paper and Wikipedia. *See*  
23 [http://www.axis.com/files/whitepaper/wp\\_h264\\_31669\\_en\\_0803\\_lo.pdf](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](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) <a href="#">Toggle additional details</a>
	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	176x144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@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](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](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.

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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](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	<b>Static</b> - Probabilities never change	<b>Adaptive</b> - Adjusts probabilities based on actual data
• Leverages correlation between symbols	<b>No</b> - Conditional probabilities ignored	<b>Yes</b> - Exploits symbol correlations by using “contexts”
• Non-integer code words	<b>No</b> - Low coding efficiency for high probability symbols	<b>Yes</b> - 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

1 [https://www.itu.int/rec/dologin\\_pub.asp?lang=e&id=T-REC-H.264-201304-](https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-)  
2 [S!!PDF-E&type=items](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:

3  
4 61. The Accused Instrumentalities compress said data block, to provide a  
5 compressed data block, based, at least in part, on said compression parameter,  
6 which can be organized in a GOP structure (see above). After its selection, the  
7 compressor (CAVLC or CABAC) will compress the video data to provide various  
8 compressed data blocks, which can also be organized in a GOP structure, as  
9 discussed previously above. See [https://sonnati.wordpress.com/2007/10/29/how-h-](https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/)  
10 [264-works-part-ii/](https://sonnati.wordpress.com/2007/10/29/how-h-264-works-part-ii/):

### 11 **Entropy Coding**

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

18 *See*

19 [http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf)  
20 [=rep1&type=pdf](http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.602.1581&rep=rep1&type=pdf) at 13:

21 Typical compression ratios to maintain excellent quality are:

- 22 • 10:1 for general images using JPEG
- 23 • 30:1 for general video using H.263 and MPEG-2
- 24 • 60:1 for general video using H.264 and WMV9

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1 See [http://www.ijera.com/papers/Vol3\\_issue4/BM34399403.pdf](http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf) at 2:

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

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

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

27 The High Profile is the most powerful  
28 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.

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

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1 services for the Accused Instrumentalities to their customers.

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

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

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

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

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

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

1 type is written to a storage device relative to a number of times that the determined  
2 data type is read from the storage device; retrieving information from the selected  
3 access profile, wherein said information comprises a compression parameter; and  
4 compressing said data block, to provide a compressed data block, based, at least in  
5 part, on said compression parameter. For example, Netflix adopted H.264 as its  
6 video codec in its products/services, such as its streaming services, and uses H.264  
7 as an encoder, encode or codec. For similar reasons, Netflix also induces its  
8 customers to use the Accused Instrumentalities to infringe other claims of the '879  
9 patent. Netflix specifically intended and was aware that these normal and  
10 customary activities would infringe the '879 patent. Netflix performed the acts  
11 that constitute induced infringement, and would induce actual infringement, with  
12 the knowledge of the '879 patent and with the knowledge, or willful blindness to  
13 the probability, that the induced acts would constitute infringement. On  
14 information and belief, Netflix engaged in such inducement to promote the sales of  
15 the Accused Instrumentalities. Accordingly, Netflix has induced and continues to  
16 induce users of the Accused Instrumentalities to use the Accused Instrumentalities  
17 in their ordinary and customary way to infringe the '879 patent, knowing that such  
18 use constitutes infringement of the '879 patent. Accordingly, Netflix has been, and  
19 currently is, inducing infringement of the '879 patent, in violation of 35 U.S.C. §  
20 271(b).

21 69. Netflix has also infringed, and continues to infringe, claims of the  
22 '879 patent by offering to commercially distribute, commercially distributing,  
23 making, and/or importing the Accused Instrumentalities, which are used in  
24 practicing the process, or using the systems, of the '879 patent, and constitute a  
25 material part of the invention. Netflix knows the components in the Accused  
26 Instrumentalities to be especially made or especially adapted for use in  
27 infringement of the '879 patent, not a staple article, and not a commodity of  
28 commerce suitable for substantial noninfringing use. Accordingly, Netflix has

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

3 70. By making, using, offering for sale, selling and/or importing into the  
4 United States the Accused Instrumentalities, and touting the benefits of using the  
5 Accused Instrumentalities’ compression features, Netflix has injured Realtime and  
6 is liable to Realtime for infringement of the ‘879 patent pursuant to 35 U.S.C. §  
7 271.

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

#### 13 **COUNT IV**

#### 14 **INFRINGEMENT OF U.S. PATENT NO. 9,769,477**

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

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

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



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

13 75. As confirmation, an article from Variety states that “Netflix has been  
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15 downloadable videos with a different flavor of H.264/AVC, which is also known  
16 as a different profile. (For the technically inclined: Netflix’s streams are encoded  
17 with **H.264/AVC Main**, whereas its downloads come in **H.264/AVC High**. The  
18 company shared more details on its tech blog this week.) This isn’t quite as  
19 effective as using VP9, but still allows Netflix to shave off some bits.” See Janko  
20 Roettgers, *Variety*, December 2, 2016, “How Netflix Delivers Better-Looking  
21 Downloads Without Eating Up All Your Phone Storage,”  
22 [http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/)  
23 [1201932502/](http://variety.com/2016/digital/news/netflix-offline-downloads-codecs-vp9-1201932502/).

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

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

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

7 **4. H.264 profiles and levels**

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

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

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

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

22 video data block. As shown below, examples of such parameters include bitrate  
 23 (or max video bitrate) and resolution parameters. Different parameters correspond  
 24 with different end applications. H.264 provides for multiple different ranges of  
 25 such parameters, each included in the “profiles” and “levels” as defined by the  
 26 H.264 standard, from the below shown paragraphs from a white paper and  
 27 Wikipedia. *See*

28 [http://www.axis.com/files/whitepaper/wp\\_h264\\_31669\\_en\\_0803\\_lo.pdf](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](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) <input type="button" value="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	176x144@15.0 (4)
1b	380,160	1,485	25,344	99	128	160	384	176x144@15.0 (4)
1.1	768,000	3,000	101,376	396	192	240	576	352x288@7.5 (2)
1.2	1,536,000	6,000	101,376	396	384	480	1,152	352x288@15.2 (6)
1.3	3,041,280	11,880	101,376	396	768	960	2,304	352x288@30.0 (6)
2	3,041,280	11,880	101,376	396	2,000	2,500	6,000	352x288@30.0 (6)
2.1	5,068,800	19,800	202,752	792	4,000	5,000	12,000	352x576@25.0 (6)
2.2	5,184,000	20,250	414,720	1,620	4,000	5,000	12,000	720x576@12.5 (5)
3	10,368,000	40,500	414,720	1,620	10,000	12,500	30,000	720x576@25.0 (5)
3.1	27,648,000	108,000	921,600	3,600	14,000	17,500	42,000	1,280x720@30.0 (5)
3.2	55,296,000	216,000	1,310,720	5,120	20,000	25,000	60,000	1,280x1,024@42.2 (4)
4	62,914,560	245,760	2,097,152	8,192	20,000	25,000	60,000	2,048x1,024@30.0 (4)
4.1	62,914,560	245,760	2,097,152	8,192	50,000	62,500	150,000	2,048x1,024@30.0 (4)
4.2	133,693,440	522,240	2,228,224	8,704	50,000	62,500	150,000	2,048x1,080@60.0 (4)
5	150,994,944	589,824	5,652,480	22,080	135,000	168,750	405,000	3,672x1,536@26.7 (5)
5.1	251,658,240	983,040	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@26.7 (5)
5.2	530,841,600	2,073,600	9,437,184	36,864	240,000	300,000	720,000	4,096x2,304@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](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](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”)

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1 corresponds with that parameter, then select between at least two asymmetric  
 2 compressors. If baseline or extended is the corresponding profile, then the system  
 3 will select a Context-Adaptive Variable Length Coding (“CAVLC”) entropy  
 4 encoder. If main or high is the corresponding profile, then the system will select a  
 5 Context-Adaptive Binary Arithmetic Coding (“CABAC”) entropy encoder. Both  
 6 encoders are asymmetric compressors because it takes a longer period of time for  
 7 them to compress data than to decompress data. See  
 8 <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	<b>Static</b> - Probabilities never change	<b>Adaptive</b> - Adjusts probabilities based on actual data
• Leverages correlation between symbols	<b>No</b> - Conditional probabilities ignored	<b>Yes</b> - Exploits symbol correlations by using “contexts”
• Non-integer code words	<b>No</b> - Low coding efficiency for high probability symbols	<b>Yes</b> - Exploits “arithmetic coding” which generates non-integer code words for higher efficiency

1 See [http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264\\_MPEG4\\_Tutorial.pdf](http://web.cs.ucla.edu/classes/fall03/cs218/paper/H.264_MPEG4_Tutorial.pdf)  
 2 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
8x8 vs. 4x4 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

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15 Moreover, the H.264 Standard requires a bit-flag descriptor, which is set to  
 16 determine the correct decoder for the corresponding encoder. As shown below, if  
 17 the flag = 0, then CAVLC must have been selected as the encoder; if the flag = 1,  
 18 then CABAC must have been selected as the encoder. See  
 19 [https://www.itu.int/rec/dologin\\_pub.asp?lang=e&id=T-REC-H.264-201304-](https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-H.264-201304-S!!PDF-E&type=items)  
 20 [S!!PDF-E&type=items](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:

21 **entropy\_coding\_mode\_flag** selects the entropy decoding method to be applied for the syntax elements for which two  
 22 descriptors appear in the syntax tables as follows:

- 23 – 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).
- 24 – 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).

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

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

4 **Entropy Coding**

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

11 See

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

14 Typical compression ratios to maintain excellent quality are:

- 15 • 10:1 for general images using JPEG
- 16 • 30:1 for general video using H.263 and MPEG-2
- 17 • 60:1 for general video using H.264 and WMV9

18 See [http://www.ijera.com/papers/Vol3\\_issue4/BM34399403.pdf](http://www.ijera.com/papers/Vol3_issue4/BM34399403.pdf) at 2:

19 Most visual communication systems today  
20 use Baseline Profile. Baseline is the simplest H.264  
21 profile and defines, for example, zigzag scanning of  
22 the picture and using 4:2:0 (YUV video formats)  
23 chrominance sampling. In Baseline Profile, the  
24 picture is split in blocks consisting of 4x4 pixels,  
25 and each block is processed separately. Another  
26 important element of the Baseline Profile is the use  
27 of Universal Variable Length Coding (UVLC) and  
28 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

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

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

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

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

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

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

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



1 asymmetric data compression encoders based upon, at least in part, the determined  
2 one or more data parameters. For example, Netflix adopted H.264 as its video  
3 codec in its products/services, such as its streaming services, and uses H.264 as an  
4 encoder, encode or codec. For similar reasons, Netflix also induces its customers  
5 to use the Accused Instrumentalities to infringe other claims of the '477 patent.  
6 Netflix specifically intended and was aware that these normal and customary  
7 activities would infringe the '477 patent. Netflix performed the acts that constitute  
8 induced infringement, and would induce actual infringement, with the knowledge  
9 of the '477 patent and with the knowledge, or willful blindness to the probability,  
10 that the induced acts would constitute infringement. On information and belief,  
11 Netflix engaged in such inducement to promote the sales of the Accused  
12 Instrumentalities. Accordingly, Netflix has induced and continues to induce users  
13 of the Accused Instrumentalities to use the Accused Instrumentalities in their  
14 ordinary and customary way to infringe the '477 patent, knowing that such use  
15 constitutes infringement of the '477 patent. Accordingly, Netflix has been, and  
16 currently is, inducing infringement of the '477 patent, in violation of 35 U.S.C. §  
17 271(b).

18 87. Netflix has also infringed, and continues to infringe, claims of the  
19 '477 patent by offering to commercially distribute, commercially distributing,  
20 making, and/or importing the Accused Instrumentalities, which are used in  
21 practicing the process, or using the systems, of the '477 patent, and constitute a  
22 material part of the invention. Netflix knows the components in the Accused  
23 Instrumentalities to be especially made or especially adapted for use in  
24 infringement of the '477 patent, not a staple article, and not a commodity of  
25 commerce suitable for substantial noninfringing use. Accordingly, Netflix has  
26 been, and currently is, contributorily infringing the '477 patent, in violation of 35  
27 U.S.C. § 271(c).

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

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1 United States the Accused Instrumentalities, and touting the benefits of using the  
2 Accused Instrumentalities’ compression features, Netflix has injured Realtime and  
3 is liable to Realtime for infringement of the ‘477 patent pursuant to 35 U.S.C. §  
4 271.

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

10 **PRAYER FOR RELIEF**

11 WHEREFORE, Plaintiff Realtime respectfully requests that this Court enter:

12 a. A judgment in favor of Plaintiff that Netflix has infringed, literally  
13 and/or under the doctrine of equivalents, the ’046, ’535, ’879, and ’477 patents (the  
14 “asserted patents” or “patents-in-suit”);  
15

16 b. A judgment and order requiring Netflix to pay Plaintiff its damages,  
17 costs, expenses, and prejudgment and post-judgment interest for its infringement of  
18 the asserted patents, as provided under 35 U.S.C. § 284;  
19

20 c. A judgment and order requiring Netflix to provide an accounting and  
21 to pay supplemental damages to Realtime, including without limitation,  
22 prejudgment and post-judgment interest;  
23

24 d. A judgment and order finding that this is an exceptional case within  
25 the meaning of 35 U.S.C. § 285 and awarding to Plaintiff its reasonable attorneys’  
26 fees against Netflix; and  
27

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

1 under the circumstances.

2 **DEMAND FOR JURY TRIAL**

3 Plaintiff, under Rule 38 of the Federal Rules of Civil Procedure, requests a  
4 trial by jury of any issues so triable by right.  
5

6 Respectfully submitted,

7 DATED: September 20, 2019

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8  
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