IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF TEXAS
TYLER DIVISION

REALTIME ADAPTIVE STREAMING LLC, Plaintiff, v. CISCO SYSTEMS, INC., Defendant.	Case No. 6:17-cv-00591-JRG JURY TRIAL DEMANDED

SECOND AMENDED COMPLAINT FOR PATENT INFRINGEMENT AGAINST CISCO

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

PARTIES

1. Realtime is a Texas limited liability company. Realtime has a place of business at 1828 E.S.E. Loop 323, Tyler, Texas 75701. Realtime has researched and developed specific solutions for data compression, including, for example, those that increase the speeds at which data can be stored and accessed. As recognition of its innovations rooted in this technological field, Realtime holds multiple United States patents and pending patent applications.

2. On information and belief, Cisco is a California corporation with its principal place of business at 170 West Tasman Drive, San Jose, California 95134. Cisco can be served through its registered agent, Prentice Hall Corporation System, 211 E. 7th Street, Suite 620, Austin, TX 78701.

3. Cisco has a regular and established place of business in this District, including, e.g., distribution facilities, employees, and other business. For example, Cisco

has a United States Sales Office at 2250 East President George Bush Turnpike, Richardson, TX 75082, which is in this District, specifically in Collin County, covered by the Sherman Division. *See* http://www.cisco.com/web/siteassets/contacts/offices/us.html.

JURISDICTION AND VENUE

4. 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).

5. This Court has personal jurisdiction over Cisco in this action because, among other reasons, Cisco has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with the forum state of Texas. For example, Cisco maintains several physical places of business within the State, including in this District at 2250 East President George Bush Turnpike, Richardson, TX 75082. Cisco directly and/or through subsidiaries or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, making, using, importing, offering for sale, and/or selling products and/or services that infringe the patents-in-suit. Thus, Cisco purposefully availed itself of the benefits of doing business in the State of Texas and the exercise of jurisdiction over Cisco would not offend traditional notions of fair play and substantial justice. Cisco is further registered to do business in the State of Texas, and has appointed Prentice Hall Corporation System, 211 E. 7th Street, Suite 620, Austin, TX 78701 as its agent for service of process.

6. Venue is proper in this district, e.g., under 28 U.S.C. § 1400(b). Cisco is registered to do business in Texas, and upon information and belief, Cisco has transacted business in the Eastern District of Texas and has committed acts of direct and indirect infringement in the Eastern District of Texas. Cisco also has a regular and established place of business in this District, as set forth above.

COUNT I

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

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

8. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,934,535 ("the '535 patent") entitled "Systems and methods for video and audio data storage and distribution." The '535 patent was duly and legally issued by the United States Patent and Trademark Office on January 13, 2015. A true and correct copy of the '535 patent is included as Exhibit A.

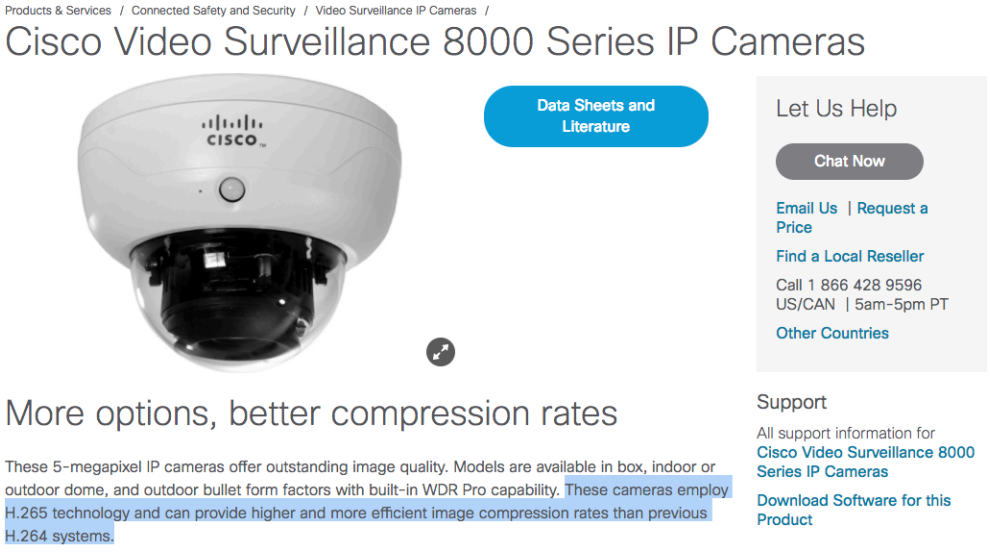
9. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '535 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP

Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager, the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, and all versions and variations thereof since the issuance of the ‘535 patent (“Accused Instrumentalities”).

10. On information and belief, Cisco 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 method claimed by Claim 15 of the

'535 patent, namely, a method, comprising: determining a parameter of at least a portion of a data block; selecting one or more asymmetric compressors from among a plurality of compressors based upon the determined parameter or attribute; compressing 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; and storing at least a portion of the one or more compressed data blocks. Upon information and belief, Cisco uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to Cisco's customers.

11. For example, the Accused Instrumentalities utilize the H.264 and the H.265 video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image compression rates than previous H.264 systems." On the same website, "H.265 compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



12. The Accused Instrumentalities also employ the H.264 or H.265 video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

Cisco Video Surveillance 8400 IP Camera

Product overview

The Cisco® Video Surveillance 8400 IP Camera is an outdoor, high-definition, full-functioned video endpoint with an integrated infrared illuminator and industry-leading image quality and processing power. The camera is capable of full 2560 x 1920 (5 MP) resolution and up to 60 frames per second (fps) performance while optimizing network usage with either H.265, H.264, or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases. Contact closures and two-way audio allow integration with microphones, speakers, and access control systems. With its open, standards-based design, the camera shown in Figure 1 provides an ideal platform for integration and operation as an independent device or as part of a Cisco Video Surveillance network.

Figure 1. Cisco Video Surveillance 8400 IP Camera

13. The Accused Instrumentalities also select and compress based on a compressor such as H.264. For example, a white paper on Cisco WebEx technology (https://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.html) states that:

> "The Cisco WebEx Meeting Center **has adopted the H.264 standards-based Scalable Video Coding (SVC) for video compression** to deliver adaptive standard-quality (SQ), high-quality (HQ), and high- definition (HD) video. HD (720p) video is currently available in Meeting Center and Training center.
>
> The video engine consists of **all the fundamental video processing modules, including capture, encoding, transmission, receiving, decoding, and rendering**. It also includes supporting modules for error control, congestion control, bit-rate adaptation, and encryption.
>
> The SVC encoding protocol allows **the captured video to be separated into multiple layers of resolutions, frame rates, and quality**. In the WebEx video encoder implementation, **raw video sequences are compressed into a single base layer** and several enhancement layers before they are transmitted to the receiving clients. The base layer in the compressed video bit streams provides a relatively low video quality and can be independently decoded. Enhancement layers serve as add-ons for the base layer to improve the video experience. If more bandwidth is available, then more enhancement layers will send, resulting in better video quality.
>
> Similarly, when network congestion occurs for any participants, the clients could save bandwidth by receiving fewer enhancement layers, gradually degrading the video quality while maintaining the best video experience and **dynamically adjusting the quality to changing conditions of the network or the participant's computer**.
>
> Depending on various conditions, such as user eligibility, subscription modes of the receivers, capability of camera and PC, network conditions, and others, one or more of the available resolutions can be encoded at the same time that the video is sent. On the receiving side, the client **automatically selects and decodes** one specific resolution. This encoding and decoding capability results in a higher bandwidth requirement for transmitting video compared to receiving video." (Emphasis added).

14. The Accused Instrumentalities also have a parameter that is selectable, such as a bitrate, according to the product literature for the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf):

Software

Table 3 describes the primary features of the Cisco Video Surveillance 8400 IP Camera software.

Table 3. Cisco Video Surveillance 8400 IP Camera primary software features

Item	Specification
Activity detection	User-definable alerts with configurable sensitivities and thresholds, email alert, and HTTP notifications
Selectable bit rate	Support for constant bit rate or variable bit rate
IP filtering	Users can enter a list of allowed or blocked IP addresses for viewing video and configuring camera settings
Configuration	• Browser-based using Internet Explorer 8.0 or later • Two levels of user access with password protection
Security	Support for IEEE 802.1X authentication

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

4. H.264 profiles and levels

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

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

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

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

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

Levels with maximum property values

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

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

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

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

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

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

H.264 Entropy Coding – Comparison of Approaches

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

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

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

- If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

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

Entropy Coding

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

See

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

at 13:

Typical compression ratios to maintain excellent quality are:

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

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

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

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

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

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

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

20. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '535 patent, for similar reasons as explained above with respect to Claim 15 of the '535 patent.

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

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

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

24. Upon information and belief, Cisco's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '535 patent by practicing a method, comprising: determining a parameter of at least a portion of a data block; selecting one or more asymmetric compressors from among a plurality of compressors based upon the determined parameter or attribute; compressing 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; and storing at least a portion of the one or more compressed data blocks. For example, Cisco adopted H.264 as its video codec in its Cisco WebEx products, its Cisco Video Surveillance IP Camera products and its Cisco TelePresence Peripheral products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '535 patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '535 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '535 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '535 patent, knowing that such use constitutes infringement of the '535 patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '535 patent, in violation of 35 U.S.C. § 271(b).

25. Cisco has also infringed, and continues to infringe, claims of the '535 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '535 patent, and constitute a material part of the invention. Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '535 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '535 patent, in violation of 35 U.S.C. § 271(c).

26. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the

Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable to Realtime for infringement of the '535 patent pursuant to 35 U.S.C. § 271.

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

COUNT II

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

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

29. Plaintiff Realtime is the owner by assignment of United States Patent No. 9,769,477 ("the '477 patent") entitled "Video data compression systems." The '477 patent was duly and legally issued by the United States Patent and Trademark Office on September 19, 2017. A true and correct copy of the '477 patent is included as Exhibit B.

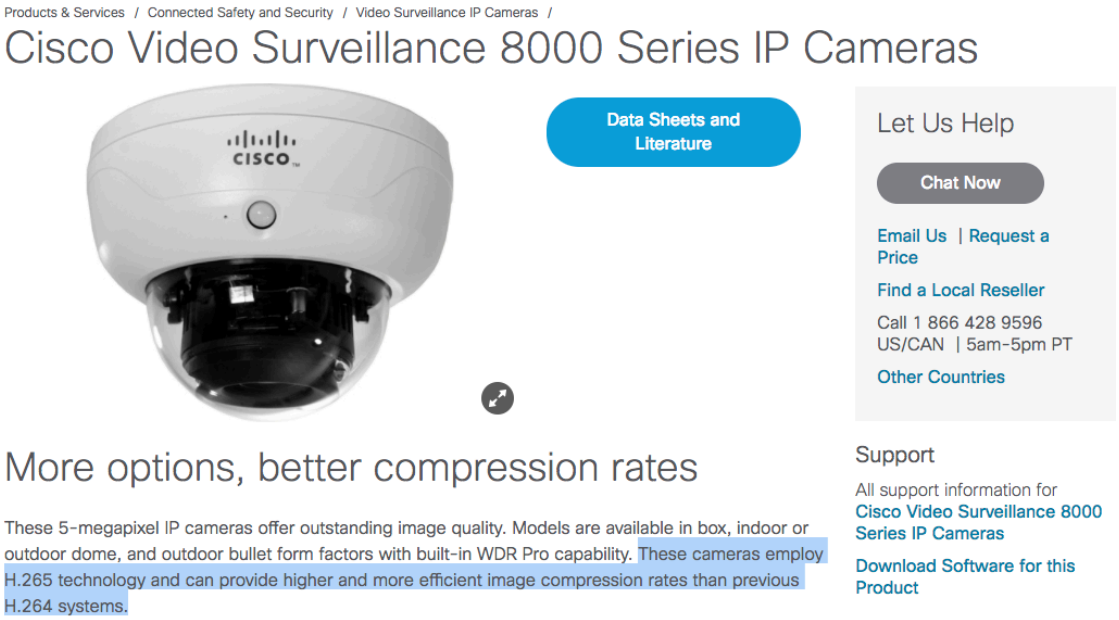
30. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '477 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video

Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager, the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, and all

versions and variations thereof since the issuance of the '477 patent ("Accused Instrumentalities").

31. On information and belief, Cisco has directly infringed and continues to infringe the '477 patent, for example, through its sale, offer for sale, importation, use and testing of the Accused Instrumentalities that practice Claim 1 of the '477 patent, namely, a system, comprising: a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms, and wherein a first asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders; and one or more processors configured to: determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second; and select one or more asymmetric data compression encoders from among the plurality of different asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters.

32. For example, the Accused Instrumentalities utilize the H.264 and the H.265 video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image compression rates than previous H.264 systems." On the same website, "H.265 compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



33. The Accused Instrumentalities also employ the H.264 or H.265 video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

34. The Accused Instrumentalities also select and compress based on a compressor such as H.264. For example, a white paper on Cisco WebEx technology (https://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.html) states that:

> "The Cisco WebEx Meeting Center **has adopted the H.264 standards-based Scalable Video Coding (SVC) for video compression** to deliver adaptive standard-quality (SQ), high-quality (HQ), and high- definition (HD) video. HD (720p) video is currently available in Meeting Center and Training center.
>
> The video engine consists of **all the fundamental video processing modules, including capture, encoding, transmission, receiving, decoding, and rendering**. It also includes supporting modules for error control, congestion control, bit-rate adaptation, and encryption.
>
> The SVC encoding protocol allows **the captured video to be separated into multiple layers of resolutions, frame rates, and quality**. In the WebEx video encoder implementation, **raw video sequences are compressed into a single base layer** and several enhancement layers before they are transmitted to the receiving clients. The base layer in the compressed video bit streams provides a relatively low video quality and can be independently decoded. Enhancement layers serve as add-ons for the base layer to improve the video experience. If more bandwidth is available, then more enhancement layers will send, resulting in better video quality.
>
> Similarly, when network congestion occurs for any participants, the clients could save bandwidth by receiving fewer enhancement layers, gradually degrading the video quality while maintaining the best video experience and **dynamically adjusting the quality to changing conditions of the network or the participant's computer**.
>
> Depending on various conditions, such as user eligibility, subscription modes of the receivers, capability of camera and PC, network conditions, and others, one or more of the available resolutions can be encoded at the same time that the video is sent. On the receiving side, the client **automatically selects and decodes** one specific resolution. This encoding and decoding capability results in a higher bandwidth requirement for transmitting video compared to receiving video." (Emphasis added).

35. The Accused Instrumentalities also have a parameter that is selectable, such as a bitrate, according to the product literature for the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf):

Software

Table 3 describes the primary features of the Cisco Video Surveillance 8400 IP Camera software.

Table 3. Cisco Video Surveillance 8400 IP Camera primary software features

Item	Specification
Activity detection	User-definable alerts with configurable sensitivities and thresholds, email alert, and HTTP notifications
Selectable bit rate	Support for constant bit rate or variable bit rate
IP filtering	Users can enter a list of allowed or blocked IP addresses for viewing video and configuring camera settings
Configuration	• Browser-based using Internet Explorer 8.0 or later • Two levels of user access with password protection
Security	Support for IEEE 802.1X authentication

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

4. H.264 profiles and levels

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

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

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

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

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

Levels with maximum property values

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

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

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

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

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

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

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

H.264 Entropy Coding – Comparison of Approaches

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

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

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

- If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

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

Entropy Coding

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

See

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

at 13:

Typical compression ratios to maintain excellent quality are:

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

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

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

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

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

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

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

41. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '477 patent, for similar reasons as explained above with respect to Claim 1 of the '477 patent.

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

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

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

45. Upon information and belief, Cisco's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '477 patent by practicing a system, comprising: a plurality of different asymmetric data compression encoders, wherein each asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to utilize one or more data compression algorithms, and wherein a first

asymmetric data compression encoder of the plurality of different asymmetric data compression encoders is configured to compress data blocks containing video or image data at a higher data compression rate than a second asymmetric data compression encoder of the plurality of different asymmetric data compression encoders; and one or more processors configured to: determine one or more data parameters, at least one of the determined one or more data parameters relating to a throughput of a communications channel measured in bits per second; and select one or more asymmetric data compression encoders from among the plurality of different asymmetric data compression encoders based upon, at least in part, the determined one or more data parameters. For example, Cisco adopted H.264 as its video codec in its Cisco WebEx products, its Cisco Video Surveillance IP Camera products and its Cisco TelePresence Peripheral products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '477 patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '477 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '477 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '477 patent, knowing that such use constitutes infringement of the '477 patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '477 patent, in violation of 35 U.S.C. § 271(b).

46. Cisco has also infringed, and continues to infringe, claims of the '477 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '477 patent, and constitute a material part of the invention.

Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '477 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '477 patent, in violation of 35 U.S.C. § 271(c).

47. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable to Realtime for infringement of the '477 patent pursuant to 35 U.S.C. § 271.

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

COUNT III

INFRINGEMENT OF U.S. PATENT NO. 8,929,442

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

50. Plaintiff Realtime is the owner by assignment of United States Patent No. 8,929,442 ("the '442 patent") entitled "System and method for video and audio data distribution." The '442 patent was duly and legally issued by the United States Patent and Trademark Office on January 6, 2015. A true and correct copy of the '442 patent is included as Exhibit C.

51. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '442 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event

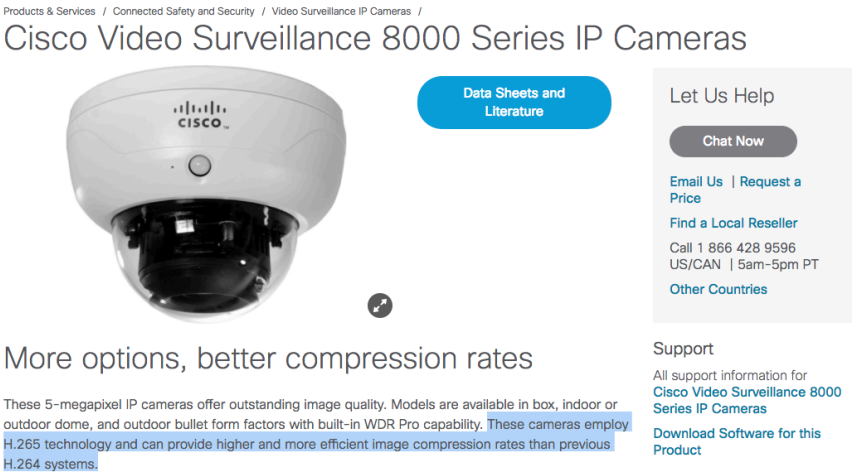
Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager, the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video

Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, and all versions and variations thereof since the issuance of the '442 patent ("Accused Instrumentalities").

52. On information and belief, Cisco has directly infringed and continues to infringe the '442 patent, for example, through its sale, offer for sale, importation, use and testing of the Accused Instrumentalities, which practices the system claimed by Claim 8 of the '442 patent, namely, an apparatus, comprising: a data decompression system configured to decompress a compressed data block; and a storage medium configured to store at least a portion of the decompressed data block, wherein at least a portion of a data block having video or audio data was compressed with one or more compression algorithms selected from among a plurality of compression algorithms based upon a throughput of a communication channel and a parameter or an attribute of the at least the portion of the data block to create at least the compressed data block, and wherein at least one of the plurality of compression algorithms is asymmetric.

53. For example, the Accused Instrumentalities utilize the H.264 and the H.265 video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image compression rates than previous H.264 systems." On the same website, "H.265

compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



54. The Accused Instrumentalities also employ the H.264 or H.265 video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

55. The Accused Instrumentalities also select and compress based on a compressor such as H.264. For example, a white paper on Cisco WebEx technology (https://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.html) states that:

> "The Cisco WebEx Meeting Center **has adopted the H.264 standards-based Scalable Video Coding (SVC) for video compression** to deliver adaptive standard-quality (SQ), high-quality (HQ), and high- definition (HD) video. HD (720p) video is currently available in Meeting Center and Training center.
>
> The video engine consists of **all the fundamental video processing modules, including capture, encoding, transmission, receiving, decoding, and rendering**. It also includes supporting modules for error control, congestion control, bit-rate adaptation, and encryption.
>
> The SVC encoding protocol allows **the captured video to be separated into multiple layers of resolutions, frame rates, and quality**. In the WebEx video encoder implementation, **raw video sequences are compressed into a single base layer** and several enhancement layers before they are transmitted to the receiving clients. The base layer in the compressed video bit streams provides a relatively low video quality and can be independently decoded. Enhancement layers serve as add-ons for the base layer to improve the video experience. If more bandwidth is available, then more enhancement layers will send, resulting in better video quality.
>
> Similarly, when network congestion occurs for any participants, the clients could save bandwidth by receiving fewer enhancement layers, gradually degrading the video quality while maintaining the best video experience and **dynamically adjusting the quality to changing conditions of the network or the participant's computer**.
>
> Depending on various conditions, such as user eligibility, subscription modes of the receivers, capability of camera and PC, network conditions, and others, one or more of the available resolutions can be encoded at the same time that the video is sent. On the receiving side, the client **automatically selects and decodes** one specific resolution. This encoding and decoding capability results in a higher bandwidth requirement for transmitting video compared to receiving video." (Emphasis added).

56. The Accused Instrumentalities also have a parameter that is selectable, such as a bitrate, according to the product literature for the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf):

Software

Table 3 describes the primary features of the Cisco Video Surveillance 8400 IP Camera software.

Table 3. Cisco Video Surveillance 8400 IP Camera primary software features

Item	Specification
Activity detection	User-definable alerts with configurable sensitivities and thresholds, email alert, and HTTP notifications
Selectable bit rate	Support for constant bit rate or variable bit rate
IP filtering	Users can enter a list of allowed or blocked IP addresses for viewing video and configuring camera settings
Configuration	• Browser-based using Internet Explorer 8.0 or later • Two levels of user access with password protection
Security	Support for IEEE 802.1X authentication

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

4. H.264 profiles and levels

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

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

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

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

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

Levels with maximum property values

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

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

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

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

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

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

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

H.264 Entropy Coding – Comparison of Approaches

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

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

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

- If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

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

Entropy Coding

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

See

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

at 13:

Typical compression ratios to maintain excellent quality are:

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

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

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

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

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

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

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

62. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '442 patent, for similar reasons as explained above with respect to Claim 8 of the '442 patent.

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

64. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the methods and/or systems claimed by the '442 patent.

65. On information and belief, Cisco has had knowledge of the '442 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '442 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Cisco will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '442 patent.

66. Upon information and belief, Cisco's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '442 patent by practicing an apparatus, comprising: a data decompression system configured to decompress a compressed data block; and a storage medium configured to store at least a portion of the decompressed data block, wherein at least a portion of a data block having video or audio data was compressed with one or

more compression algorithms selected from among a plurality of compression algorithms based upon a throughput of a communication channel and a parameter or an attribute of the at least the portion of the data block to create at least the compressed data block, and wherein at least one of the plurality of compression algorithms is asymmetric. For example, Cisco adopted H.264 as its video codec in its Cisco WebEx products, its Cisco Video Surveillance IP Camera products and its Cisco TelePresence Peripheral products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '442 patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '442 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '442 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '442 patent, knowing that such use constitutes infringement of the '442 patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '442 patent, in violation of 35 U.S.C. § 271(b).

67. Cisco has also infringed, and continues to infringe, claims of the '442 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '442 patent, and constitute a material part of the invention. Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '442 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '442 patent, in violation of 35 U.S.C. § 271(c).

68. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable to Realtime for infringement of the '442 patent pursuant to 35 U.S.C. § 271.

69. As a result of Cisco's infringement of the '442 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco, together with interest and costs as fixed by the Court.

COUNT IV

INFRINGEMENT OF U.S. PATENT NO. 9,762,907

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

71. Plaintiff Realtime is the owner by assignment of United States Patent No. 9,762,907 ("the '907 patent") entitled "System and methods for video and audio data distribution." The '907 patent was duly and legally issued by the United States Patent and Trademark Office on September 12, 2017. A true and correct copy of the '907 patent is included as Exhibit D.

72. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '907 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video

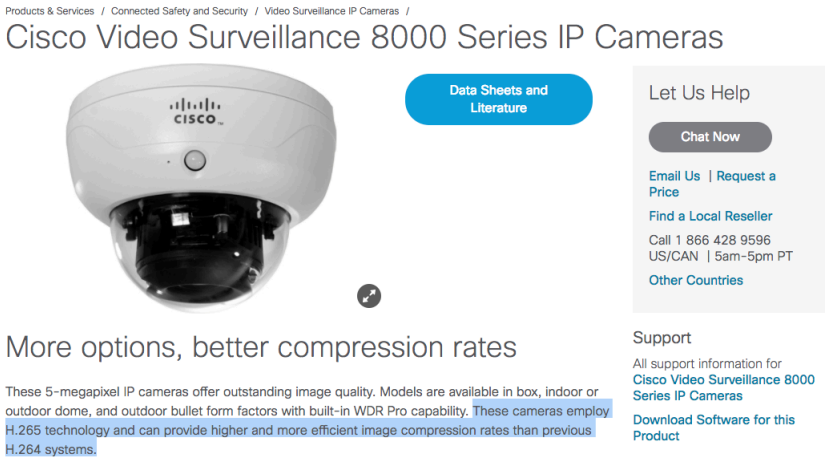
Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager, the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence

ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, and all versions and variations thereof since the issuance of the '907 patent ("Accused Instrumentalities").

73. On information and belief, Cisco has directly infringed and continues to infringe the '907 patent, for example, through its sale, offer for sale, importation, use and testing of the Accused Instrumentalities, which practices the system claimed by Claim 1 of the '907 patent, namely, a system comprising: one or more different asymmetric data compression algorithms, wherein each algorithm of the one or more different asymmetric data compression algorithms utilizes one or more asymmetric data compression routines of a plurality of different asymmetric data compression routines, wherein a first asymmetric data compression routine of the plurality of different asymmetric data compression routines is configured to produce compressed data with a higher data rate for a given data throughput than a second asymmetric data compression routine of the plurality of different asymmetric data compression routines; and a processor configured: to analyze one or more data parameters from one or more data blocks containing video data, wherein at least one data parameter relates to an expected or anticipated throughput of a communications channel; and to select two or more different data compression routines from among a plurality of different data compression routines based upon, at least in part, the one or more data parameters relating to the expected or anticipated throughput of the communications channel.

74. For example, the Accused Instrumentalities utilize the H.264 and the H.265 video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image

compression rates than previous H.264 systems." On the same website, "H.265 compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



75. The Accused Instrumentalities also employ the H.264 or H.265 video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

76. The Accused Instrumentalities also select and compress based on a compressor such as H.264. For example, a white paper on Cisco WebEx technology (https://www.cisco.com/c/en/us/products/collateral/conferencing/webex-meeting-center/white_paper_c11-691351.html) states that:

> "The Cisco WebEx Meeting Center **has adopted the H.264 standards-based Scalable Video Coding (SVC) for video compression** to deliver adaptive standard-quality (SQ), high-quality (HQ), and high- definition (HD) video. HD (720p) video is currently available in Meeting Center and Training center.
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> Similarly, when network congestion occurs for any participants, the clients could save bandwidth by receiving fewer enhancement layers, gradually degrading the video quality while maintaining the best video experience and **dynamically adjusting the quality to changing conditions of the network or the participant's computer**.
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> Depending on various conditions, such as user eligibility, subscription modes of the receivers, capability of camera and PC, network conditions, and others, one or more of the available resolutions can be encoded at the same time that the video is sent. On the receiving side, the client **automatically selects and decodes** one specific resolution. This encoding and decoding capability results in a higher bandwidth requirement for transmitting video compared to receiving video." (Emphasis added).

77. The Accused Instrumentalities also have a parameter that is selectable, such as a bitrate, according to the product literature for the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf):

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4. H.264 profiles and levels

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

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

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

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

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

Levels with maximum property values

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

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

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

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

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

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

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

H.264 Entropy Coding – Comparison of Approaches

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

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

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

- If entropy_coding_mode_flag is equal to 0, the method specified by the left descriptor in the syntax table is applied (Exp-Golomb coded, see clause 9.1 or CAVLC, see clause 9.2).
- Otherwise (entropy_coding_mode_flag is equal to 1), the method specified by the right descriptor in the syntax table is applied (CABAC, see clause 9.3).

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

Entropy Coding

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

See

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

at 13:

Typical compression ratios to maintain excellent quality are:

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

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

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

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

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

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

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

83. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '907 patent, for similar reasons as explained above with respect to Claim 1 of the '907 patent.

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

85. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the methods and/or systems claimed by the '907 patent.

86. On information and belief, Cisco has had knowledge of the '907 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '907 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Cisco will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '907 patent.

87. Upon information and belief, Cisco's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '907 patent by practicing a system comprising: one or more different asymmetric data compression algorithms, wherein each algorithm of the one or more different asymmetric data compression algorithms utilizes one or more asymmetric data compression routines of a plurality of different asymmetric data

compression routines, wherein a first asymmetric data compression routine of the plurality of different asymmetric data compression routines is configured to produce compressed data with a higher data rate for a given data throughput than a second asymmetric data compression routine of the plurality of different asymmetric data compression routines; and a processor configured: to analyze one or more data parameters from one or more data blocks containing video data, wherein at least one data parameter relates to an expected or anticipated throughput of a communications channel; and to select two or more different data compression routines from among a plurality of different data compression routines based upon, at least in part, the one or more data parameters relating to the expected or anticipated throughput of the communications channel. For example, Cisco adopted H.264 as its video codec in its Cisco WebEx products, its Cisco Video Surveillance IP Camera products and its Cisco TelePresence Peripheral products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '907 patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '907 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '907 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continues to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '907 patent, knowing that such use constitutes infringement of the '907 patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '907 patent, in violation of 35 U.S.C. § 271(b).

88. Cisco has also infringed, and continues to infringe, claims of the '907 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or

using the systems, of the '907 patent, and constitute a material part of the invention. Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '907 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '907 patent, in violation of 35 U.S.C. § 271(c).

89. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable to Realtime for infringement of the '907 patent pursuant to 35 U.S.C. § 271.

90. As a result of Cisco's infringement of the '907 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco, together with interest and costs as fixed by the Court.

COUNT V

INFRINGEMENT OF U.S. PATENT NO. RE46,777

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

92. Plaintiff Realtime is the owner by assignment of United States Patent No. RE46,777 ("the '777 patent") entitled "Quantization for Hybrid Video Coding." The '777 patent was duly and legally issued by the United States Patent and Trademark Office on April 3, 2018. The '777 patent is a reissue of U.S. Pat. No. 8,634,462, which was issued on January 21, 2014. A true and correct copy of the '777 patent is included as Exhibit E.

93. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '777 patent, and continues to do so. By way of illustrative example, these infringing products include,

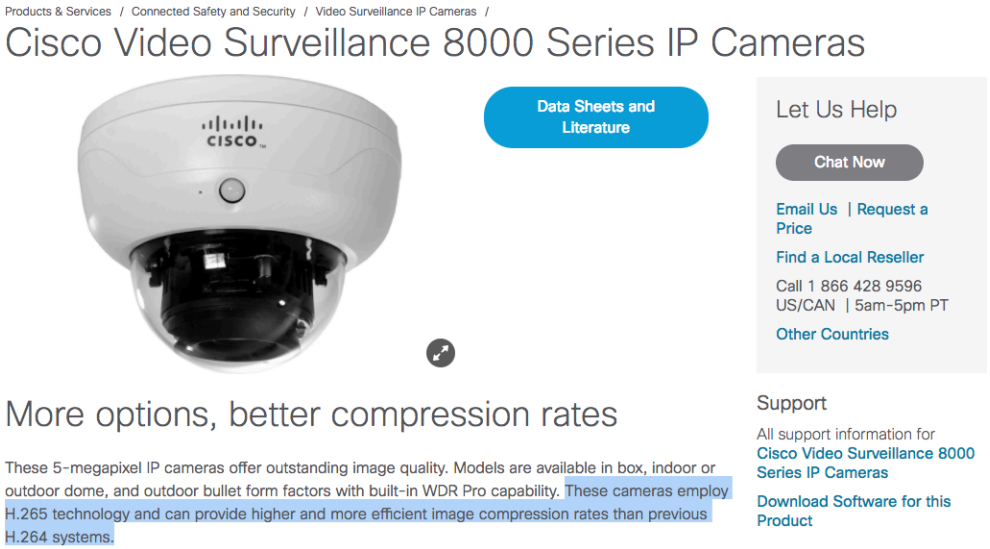
without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager,

the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, the Cisco collaboration room system products MX700, MX800, MX800 Dual, Cisco Spark Room Kit, Cisco Spark Room Kit Plus, SX80, the Cisco immersive products IX5000, IX5200, the Cisco AnyRes Live encoders including the Cisco AnyRes Live 9500 UHD Encoder, Cisco AnyRes Live 5300HE, Cisco AnyRes Live 9400, and all versions and variations thereof since the issuance of the '777 patent ("Accused Instrumentalities").

94. On information and belief, Cisco has directly infringed and continues to infringe the '777 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the method claimed by Claim 1 of the '777 patent, namely, a method for coding a video signal using hybrid coding, comprising: reducing temporal redundancy by block based motion compensated prediction in order to establish a prediction error signal; performing quantization on samples of the prediction error signal or on coefficients resulting from a transformation of the prediction error signal into the frequency domain to obtain quantized values, representing quantized samples or quantized coefficients respectively, wherein the prediction error signal includes a plurality of subblocks each including a plurality of quantized values; calculating a first quantization efficiency for the quantized values of at least one subblock of the plurality of subblocks; setting the quantized values of the at least one subblock to

all zeroes; calculating a second quantization efficiency for the at least one subblock while all of the quantized values are zeroes; selecting which of the first and second quantization efficiencies is a higher efficiency; and selecting, for further proceeding, the at least one subblock with the quantized values prior to setting the quantized values of the at least one subblock to all zeroes if the first quantization efficiency is higher and selecting the at least one subblock with the quantized values set to zero, for further proceeding, if the second quantization efficiency is higher. Upon information and belief, Cisco uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to Cisco's customers.

95. For example, the Accused Instrumentalities utilize the H.265 (or HEVC) video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image compression rates than previous H.264 systems." On the same website, "H.265 compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



96. The Accused Instrumentalities also employ the H.265 (or HEVC) video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

Cisco Video Surveillance 8400 IP Camera

Product overview

The Cisco® Video Surveillance 8400 IP Camera is an outdoor, high-definition, full-functioned video endpoint with an integrated infrared illuminator and industry-leading image quality and processing power. The camera is capable of full 2560 x 1920 (5 MP) resolution and up to 60 frames per second (fps) performance while optimizing network usage with either H.265, H.264, or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases. Contact closures and two-way audio allow integration with microphones, speakers, and access control systems. With its open, standards-based design, the camera shown in Figure 1 provides an ideal platform for integration and operation as an independent device or as part of a Cisco Video Surveillance network.

Figure 1. Cisco Video Surveillance 8400 IP Camera

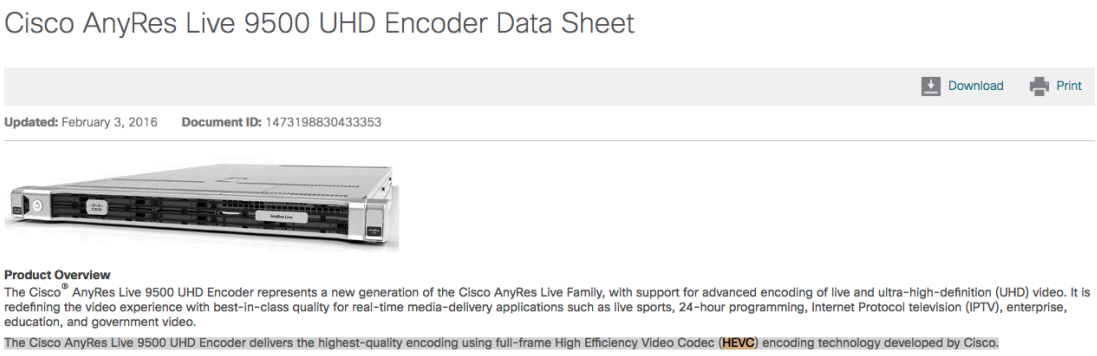
97. Furthermore, a piece of Cisco literature also states that the Cisco collaboration room system products MX700, MX800, MX800 Dual, Cisco Spark Room Kit, Cisco Spark Room Kit Plus, SX80, IX5000, IX5200, "supports…**H.265**" and supports "Video Standards" of "H.265 (SIP [Session Initiation Protocol] only for **H.265**)." *See* https://www.cisco.com/c/dam/en/us/products/collateral/collaboration-endpoints/sales-tool-c96-739424.pdf (pages 2, 4, 5, 8) (emphasis added).

98. Moreover, that same piece of Cisco literature states for the Cisco collaboration room system product SX80 that the "SX80 is a powerful codec platform to build large, custom video-collaboration environments; delivers up to a 1080p60 end-to-end HD video and offers industry first support for **H.265** for future bandwidth efficiencies" (*Id.* at page 4) (emphasis added) and for the Cisco immersive products IX5000 and IX5200, the Cisco IX5000/IX5200 "is the most state-of-the-art triple-screen system combining high fidelity audio/video and rich collaboration functionality for the most vivid immersive collaboration experience possible. As the first single-codec, **H.265** triple-screen product, the [IX5000/IX5200] is both powerful and efficient." (*Id.* at page 8) (emphasis added). "**H.265**" is also listed for the IX5000 and IX5200 as one of the supported "Video Standards," "Video Frame Rate[s]," "Signaling Protocol[s]," and "Bandwidth Consumption" ("Maximum requirement – 1080p, 60fps at 10.8 Mbps (**H.265**)"). *Id.* (emphasis added).

99. Another Cisco website describing the Cisco TelePresence SX80 Codec and product states: "The SX80 delivers up to 1080p60 end-to-end, high-definition (HD) video. It's the first in the industry to offer support for **H.265**, which lays the foundation for future bandwidth efficiencies made possible by the new standard." *See* https://www.cisco.com/c/en/us/products/collaboration-endpoints/telepresence-sx80-codec/index.html. There is also a 2 minute, 36 second video uploaded onto the official "CiscoFrance" Youtube channel entitled "Cisco demonstrates H.265 – high quality video with great bandwidth efficiency" that describes Cisco's implementation of H.265 in its various products, including the Accused Instrumentalities. *See* https://www.youtube.com/watch?v=QuJSeT0T5tQ.

100. Additional web pages for Cisco products such as the Cisco AnyRes Live encoders list encoders that utilize the High Efficiency Video Codec (HEVC), which is synonymous with H.265. Take for example the "Product Overview" description for the

Cisco AnyRes Live 9500 UHD Encoder Data Sheet at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-live/datasheet-c78-734319.html (stating "The Cisco AnyRes Live 9500 UHD Encoder delivers the highest-quality encoding using full-frame **High Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):


Cisco AnyRes Live 9500 UHD Encoder Data Sheet

Download Print

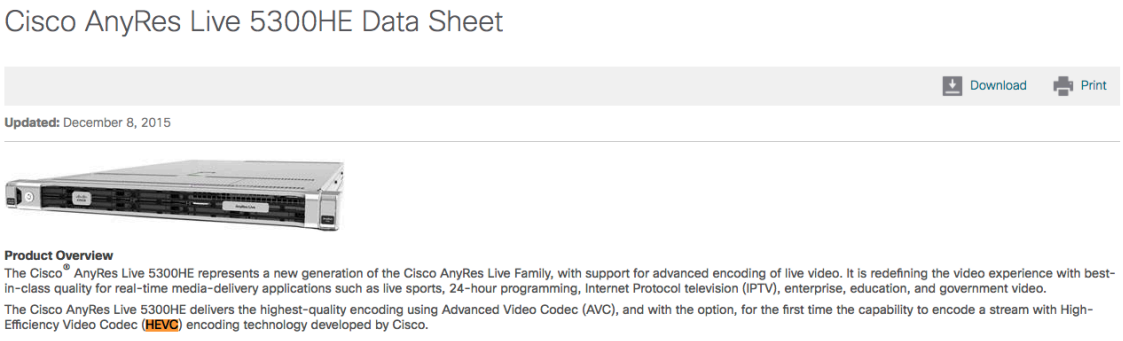
Updated: February 3, 2016 **Document ID:** 1473198830433353

Product Overview

The Cisco® AnyRes Live 9500 UHD Encoder represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live and ultra-high-definition (UHD) video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 9500 UHD Encoder delivers the highest-quality encoding using full-frame High Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

101. A similar Cisco product description that highlights HEVC functionality can be found for the data sheet describing the Cisco AnyRes Live 5300HE at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-live/datasheet-c78-736220.html (stating "The Cisco AnyRes Live 5300HE delivers the highest-quality encoding using Advanced Video Codec (AVC), and with the option, for the first time the capability to encode a stream with **High-Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):


Cisco AnyRes Live 5300HE Data Sheet

Download Print

Updated: December 8, 2015

Product Overview

The Cisco® AnyRes Live 5300HE represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 5300HE delivers the highest-quality encoding using Advanced Video Codec (AVC), and with the option, for the first time the capability to encode a stream with High-Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

102. Another similar Cisco product description that highlights HEVC functionality can be found for the data sheet describing the Cisco AnyRes Live 9400 at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-

live/datasheet-c78-736222.html (stating "The Cisco AnyRes Live 9400 delivers the highest-quality encoding using market-leading H.264 encoding or optionally using full-frame **High-Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):

Cisco AnyRes Live 9400 Data Sheet

Download Print

Updated: December 8, 2015

Product Overview

The Cisco® AnyRes Live 9400 represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live and high-definition (HD) video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 9400 delivers the highest-quality encoding using market-leading H.264 encoding or optionally using full-frame High-Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

103. The Accused Instrumentalities performs a method for coding a video signal using hybrid coding. For example, the aim of the coding process is the production of a bitstream, as defined in definition 3.12 of the ITU-T H.265 Series H: Audiovisual and Multimedia Systems, "Infrastructure of audiovisual services – Coding of moving video" High efficiency video coding ("HEVC Spec"): "bitstream: A sequence of bits, in the form of a NAL unit stream or a byte stream, that forms the representation of coded pictures and associated data forming one or more coded video sequences (CVSs)." *See also, e.g.,* "Overview of the High Efficiency Video Coding (HEVC) Standard" by Gary J. Sullivan, Fellow, IEEE, Jens-Rainer Ohm, Member, IEEE, Woo-Jin Han, Member, IEEE, and Thomas Wiegand, Fellow, IEEE, published in IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 22, NO. 12, DECEMBER 2012 ("IEEE HEVC) ("The video coding layer of HEVC employs the same hybrid approach (inter-/intrapicture prediction and 2-D transform coding) used in all video compression standards since H.261"). *See also, e.g.,* HEVC Spec at 0.7 "Overview of the design characteristics."

104. The Accused Instrumentalities reduce temporal redundancy by block based motion compensated prediction in order to establish a prediction error signal. For

example, clause 8.5.3 Decoding process for prediction units in inter prediction mode and the subclauses thereof of the HEVC Spec describe the block based motion compensation techniques used in the decoding process. *See also, e.g.,* IEEE HEVC at 1651-1652 6) Motion compensation: Quarter-sample precision is used for the MVs, and 7-tap or 8-tap filters are used for interpolation of fractional-sample positions (compared to six-tap filtering of half-sample positions followed by linear interpolation for quarter-sample positions in H.264/MPEG-4 AVC). Similar to H.264/MPEG-4 AVC, multiple reference pictures are used. For each PB, either one or two motion vectors can be transmitted, resulting either in unipredictive or bipredictive coding, respectively. As in H.264/MPEG-4 AVC, a scaling and offset operation may be applied to the prediction signal(s) in a manner known as weighted prediction.").

105. The Accused Instrumentalities perform quantization on samples of the prediction error signal or on coefficients resulting from a transformation of the prediction error signal into the frequency domain to obtain quantized values, representing quantized samples or quantized coefficients respectively. For example, the quantization parameter and the scaling (inverse quantization) are defined in definitions 3.112 (page 10) and 3.131 (page 11), respectively, the usage of the scaling process in the decoding being described in clause and 8.6 Scaling, transformation and array construction process prior to deblocking filter process of the HEVC Spec. *See also, e.g.,* IEEE HEVC at 1652 ("8) Quantization control: As in H.264/MPEG-4 AVC, uniform reconstruction quantization (URQ) is used in HEVC, with quantization scaling matrices supported for the various transform block sizes.").

106. The Accused Instrumentalities perform a method wherein the prediction error signal includes a plurality of subblocks each including a plurality of quantized values. For example, the quantized samples or transform coefficients from the subblock are scaled and transformed as described in above mentioned clause 8.6 of the HEVC Spec. *See also, e.g.,* IEEE HEVC at 1652 ("Prediction units and prediction blocks (PBs):

The decision whether to code a picture area using interpicture or intrapicture prediction is made at the CU level. A PU partitioning structure has its root at the CU level. Depending on the basic prediction-type decision, the luma and chroma CBs can then be further split in size and predicted from luma and chroma prediction blocks (PBs). HEVC supports variable PB sizes from 64×64 down to 4×4 samples.").

107. The Accused Instrumentalities perform a method of calculating a first quantization efficiency for the quantized values of at least one subblock of the plurality of subblocks; setting the quantized values of the at least one subblock to all zeroes; calculating a second quantization efficiency for the at least one subblock while all of the quantized values are zeroes; selecting which of the first and second quantization efficiencies is a higher efficiency; and selecting, for further proceeding, the at least one subblock with the quantized values prior to setting the quantized values of the at least one subblock to all zeroes if the first quantization efficiency is higher and selecting the at least one subblock with the quantized values set to zero, for further proceeding, if the second quantization efficiency is higher. For example, the bitstream resulting from the encoding as described in this last item of the claim contains all the relevant information as needed by the decoder for proper decoding. If the coefficients of the subblock are set to zero as a consequence of the efficiency calculation, the coded_sub_block_flag, as described in clause 7.4.9.11 Residual coding semantics, HEVC Spec, is set to 0, indicating that all the 16 coefficients of the coded sub block have been set to 0: "coded_sub_block_flag[xS][yS] specifies the following for the sub-block at location (xS, yS) within the current transform block, where a sub-block is a (4x4) array of 16 transform coefficient levels: – If coded_sub_block_flag[xS][yS] is equal to 0, the 16 transform coefficient levels of the sub-block at location (xS, yS) are inferred to be equal to 0."

108. When coded_sub_block_flag[xS][yS] has not been set equal to 0, the position in the array of non 0 coefficients can be determined as follows:

– Otherwise (coded_sub_block_flag[xS][yS] is equal to 1), the following applies:

– If (xS, yS) is equal to (0, 0) and (LastSignificantCoeffX, LastSignificantCoeffY) is not equal to (0, 0), at least one of the 16 sig_coeff_flag syntax elements is present for the sub-block at location (xS, yS) .

– Otherwise, at least one of the 16 transform coefficient levels of the sub-block at location (xS, yS) has a non zero value.

When coded_sub_block_flag[xS][yS] is not present, it is inferred as follows:

– If one or more of the following conditions are true, coded_sub_block_flag[xS][yS] is inferred to be equal to 1:

– (xS, yS) is equal to (0, 0)

– (xS, yS) is equal to (LastSignificantCoeffX >> 2 , LastSignificantCoeffY >> 2)

– Otherwise, coded_sub_block_flag[xS][yS] is inferred to be equal to 0.

HEVC Spec at 7.4.9.11 Residual coding semantics. Therefore, even though the coding algorithms than can be used for reaching specific efficiency targets are not specified by the HEVC Spec (as stated in clause 0.7), this particular combination of choices produces a valid bitstream that has to be decoded by a conformant decoder.

109. The infringement of the Accused Instrumentalities is also shown by way of considering the reference software (*see, e.g.,* https://hevc.hhi.fraunhofer.de/). Setting the flag RDOQ=true in the encoder configuration file enables rate-distortion-optimized quantization for transformed TUs. This feature is implemented in the HM reference software as function xRateDistOptQuant in file TComTrQuant.cpp. In the function xRateDistOptQuant, the efficiency for setting all quantized values to zero is calculated and stored in the variable d64BestCost. In the variable iBestLastIdxP1, a 0 is stored indicating that all values starting from the 0th position are set to zero. Afterwards, the

efficiency for keeping quantized values unequal to zero is calculated and stored in the variable totalCost. The variable iBestLastIdxP1 is adjusted correspondingly to values unequal to 0. The two efficiencies d64BestCost and totalCost are compared, and selecting for further proceeding either quantized values, which are all set to zero or quantized values, which are not all set to zero. All values starting from the position defined by the variable iBestLastIdxP1 are set to zero.

110. Calculation of the efficiency for setting all quantized values to zero and storing the result in the variable d64BestCost:

```
Double  d64BestCost         = 0;
Int     ui16CtxCbf          = 0;
Int     iBestLastIdxP1      = 0;
if( !pcCU->isIntra( uiAbsPartIdx ) && isLuma(compID) && pcCU->getTransformIdx( uiAbsPartIdx ) == 0 )
{
  ui16CtxCbf   = 0;
  d64BestCost  = d64BlockUncodedCost + xGetICost( m_pcEstBitsSbac->blockRootCbpBits[ ui16CtxCbf ][ 0 ] );
  d64BaseCost += xGetICost( m_pcEstBitsSbac->blockRootCbpBits[ ui16CtxCbf ][ 1 ] );
}
else
{
  ui16CtxCbf   = pcCU->getCtxQtCbf( rTu, channelType );
  ui16CtxCbf  += getCBFContextOffset(compID);
  d64BestCost  = d64BlockUncodedCost + xGetICost( m_pcEstBitsSbac->blockCbpBits[ ui16CtxCbf ][ 0 ] );
  d64BaseCost += xGetICost( m_pcEstBitsSbac->blockCbpBits[ ui16CtxCbf ][ 1 ] );
}
```

HEVC Reference Software (https://hevc.hhi.fraunhofer.de/).

111. Calculating the efficiency for keeping quantized values unequal to zero and storing the result in the variable totalCost:

```
Bool bFoundLast = false;
for (Int iCGScanPos = iCGLastScanPos; iCGScanPos >= 0; iCGScanPos--)
{
  UInt uiCGBlkPos = codingParameters.scanCG[ iCGScanPos ];

  d64BaseCost -= pdCostCoeffGroupSig [ iCGScanPos ];
  if (uiSigCoeffGroupFlag[ uiCGBlkPos ])
  {
    for (Int iScanPosinCG = uiCGSize-1; iScanPosinCG >= 0; iScanPosinCG--)
    {
      iScanPos = iCGScanPos*uiCGSize + iScanPosinCG;

      if (iScanPos > iLastScanPos) continue;
      UInt   uiBlkPos     = codingParameters.scan[iScanPos];

      if( piDstCoeff[ uiBlkPos ] )
      {
        UInt   uiPosY       = uiBlkPos >> uiLog2BlockWidth;
        UInt   uiPosX       = uiBlkPos - ( uiPosY << uiLog2BlockWidth );

        Double d64CostLast= codingParameters.scanType == SCAN_VER ? xGetRateLast( uiPosY, uiPosX, compID ) :
                                                                    xGetRateLast( uiPosX, uiPosY, compID );
        Double totalCost = d64BaseCost + d64CostLast - pdCostSig[ iScanPos ];
```

HEVC Reference Software (https://hevc.hhi.fraunhofer.de/).

112. Comparing the two efficiencies d64BestCost and totalCost:

```
if( totalCost < d64BestCost )
{
  iBestLastIdxP1  = iScanPos + 1;
  d64BestCost     = totalCost;
}
```

HEVC Reference Software (https://hevc.hhi.fraunhofer.de/).

113. Selecting for further proceeding either quantized values, which are all set to zero or quantized values, which are not all set to zero:

```
//===== clean uncoded coefficients =====
for ( Int scanPos = iBestLastIdxP1; scanPos <= iLastScanPos; scanPos++ )
{
  piDstCoeff[ codingParameters.scan[ scanPos ] ] = 0;
}
```

HEVC Reference Software (https://hevc.hhi.fraunhofer.de/).

114. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '777 patent, for similar reasons as explained above with respect to Claim 1 of the '777 patent.

115. On information and belief, all of the Accused Instrumentalities perform the claimed methods in substantially the same way, e.g., in the manner specified in the HEVC (or H.265) standard.

116. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the methods and/or systems claimed by the '777 patent.

117. On information and belief, Cisco has had knowledge of the '777 patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '777 patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Cisco will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the '777 patent.

118. Upon information and belief, Cisco's affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the '777 patent by practicing a method for coding a video signal using hybrid coding, comprising: reducing temporal redundancy by block based motion compensated prediction in order to establish a prediction error signal; performing quantization on samples of the prediction error signal or on coefficients resulting from a transformation of the prediction error signal into the frequency domain to obtain quantized values, representing quantized samples or quantized coefficients respectively, wherein the prediction error signal includes a plurality of subblocks each including a plurality of quantized values; calculating a first quantization efficiency for the quantized values of at least one subblock of the plurality of subblocks; setting the quantized values of the at least one subblock to all zeroes; calculating a second quantization efficiency for the at least one subblock while all of the quantized values are zeroes; selecting which of the first and second quantization efficiencies is a higher efficiency; and selecting, for further proceeding, the at least one subblock with the quantized values prior to setting the quantized values of the at least one subblock to all zeroes if the first quantization efficiency is higher and selecting the at least one subblock with the quantized values set to zero, for further proceeding, if the second quantization efficiency is higher. For example, Cisco adopted HEVC (or H.265) as its video codec in its products/services, such as in its surveillance video camera, collaboration room system, immersive and video encoder products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '777 patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '777 patent. Cisco performed the acts that constitute induced infringement, and would

induce actual infringement, with the knowledge of the '777 patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continue to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '777 patent, knowing that such use constitutes infringement of the '777 patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '777 patent, in violation of 35 U.S.C. § 271(b).

119. Cisco has also infringed, and continues to infringe, claims of the '777 patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '777 patent, and constitute a material part of the invention. Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '777 patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '777 patent, in violation of 35 U.S.C. § 271(c).

120. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable to Realtime for infringement of the '777 patent pursuant to 35 U.S.C. § 271.

121. As a result of Cisco's infringement of the '777 patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco, together with interest and costs as fixed by the Court.

COUNT VI

INFRINGEMENT OF U.S. PATENT NO. 9,578,298

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

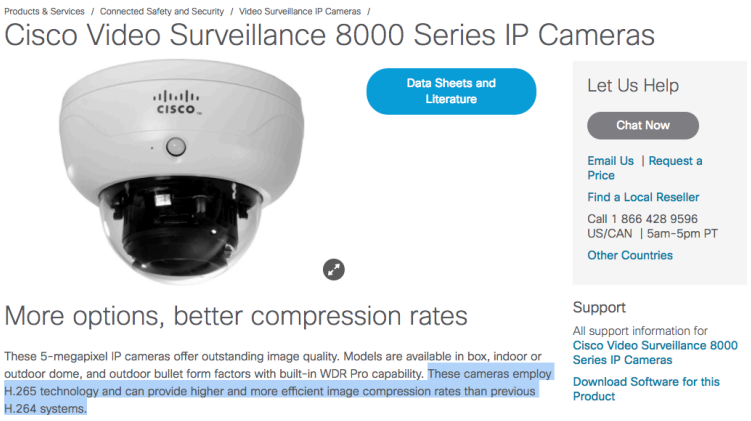
123. Plaintiff Realtime is the owner by assignment of United States Patent No. 9,578,298 ("the '298 patent") entitled "Method for Decoding 2D-Compatible Stereoscopic Video Flows." The '298 patent was duly and legally issued by the United States Patent and Trademark Office on February 21, 2017. A true and correct copy of the '777 patent is included as Exhibit F.

124. On information and belief, Cisco has made, used, offered for sale, sold and/or imported into the United States Cisco products that infringe the '298 patent, and continues to do so. By way of illustrative example, these infringing products include, without limitation, Cisco's streaming and web conferencing products/services, such as, e.g., Cisco WebEx products including Cisco Meeting Center and Cisco WebEx Event Center, as well as Cisco Video Surveillance IP Camera products including the Cisco Video Surveillance 3520 IP Camera; the Cisco Video Surveillance 3535 IP Camera; the Cisco Video Surveillance 3620 IP Camera; the Cisco Video Surveillance 3630 IP Camera; the Cisco Video Surveillance 6020 IP Camera; the Cisco Video Surveillance 6030 IP Camera; the Cisco Video Surveillance 6620 IP Camera; the Cisco Video Surveillance 6630 IP Camera; the Cisco Video Surveillance 7030E IP Camera; the Cisco Video Surveillance 7530PD IP Camera; the Cisco Video Surveillance 6000 Series IP Cameras including the Cisco Video Surveillance 6000P IP Camera, the Cisco Video Surveillance 6400E IP Camera, and the Cisco Video Surveillance 6500PD IP Camera; the Cisco Video Surveillance 3050 IP Camera; the Cisco Video Surveillance 7070 IP Camera; Cisco Video Surveillance 2800 Series Standard Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 2800 Series IP Cameras) including the Cisco Video Surveillance 2830 IP Camera and the Cisco Video Surveillance 2835 IP

Camera; Cisco Video Surveillance 6900 Series High Definition PTZ IP Cameras (also known as the Cisco Video Surveillance 6900 Series IP Cameras) including the Cisco Video Surveillance 6930 IP Camera; the Cisco Video Surveillance 8-Port Encoder; the Cisco Video Surveillance 4-Port Encoder; Cisco Meraki MV Security Cameras including the Cisco Meraki MV21 Security Camera and the Cisco Meraki MV71 Security Camera; the Cisco Video Surveillance Manager software platform including the Cisco Connected Safety and Security Unified Computer System (UCS) platform including Cisco Connected Safety and Security UCS M4, C220, C240, B-Series, C-Series, E-Series, Express, the Cisco Physical Security Multiservices Platform (MSP) for Video Surveillance, Cisco Video Surveillance Manager (VSM) 7, including the Cisco VSM for Cisco UCS B and C Series Servers, the Cisco VSM for Cisco UCS E-Series Servers, the Cisco VSM for Cisco UCS Express, the Cisco Video Surveillance Operations Manager, the Cisco Video Surveillance Media Server, the Cisco Video Surveillance Safety and Security Desktop, and the Cisco Video Surveillance Manager Express; the Cisco Video Analytics software including the Cisco Base Video Analytics Package (further including the Security Base package or Security Package and the Counting Base package), the Cisco Advanced Video Analytics Package (further including the Counting Advanced package), the Cisco Flow Violation Analysis Package and the Cisco Crowd Monitoring Analytic Package, Cisco Telepresence Peripherals including the Cisco TelePresence ISDN Link, the Cisco TelePresence SpeakerTrack 60 Camera, the Cisco TelePresence Precision 60 Camera, the Cisco TelePresence Precision 40 Camera, the Cisco TelePresence Precision 12X Camera and the Cisco TelePresence Touch devices, the Cisco collaboration room system products MX700, MX800, MX800 Dual, Cisco Spark Room Kit, Cisco Spark Room Kit Plus, SX80, the Cisco immersive products IX5000, IX5200, the Cisco AnyRes Live encoders including the Cisco AnyRes Live 9500 UHD Encoder, Cisco AnyRes Live 5300HE, Cisco AnyRes Live 9400, and all versions and variations thereof since the issuance of the ‘298 patent (“Accused Instrumentalities”).

125. On information and belief, Cisco has directly infringed and continues to infringe the '298 patent, for example, through its own use and testing of the Accused Instrumentalities, which when used, practices the method claimed by Claim 1 of the '298 patent, namely, a method for processing a video stream of digital images, the method comprising the steps of: receiving the video stream which comprises at least one composite frame (FC), each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format; generating an output video stream which can be reproduced on a visualization apparatus, receiving metadata which determine an area occupied by one of the two images within said composite frame (FC), said metadata indicating either a geometry of the frame packing format or a frame packing type of said composite frame (FC); determining the area in the composite frame (FC) which is occupied by said one image of the stereoscopic pair within the composite frame based on said metadata; decoding only that part of the composite frame (FC) which contains said one image to be displayed, and generating an output frame containing said decoded image. Upon information and belief, Cisco uses the Accused Instrumentalities to practice infringing methods for its own internal non-testing business purposes, while testing the Accused Instrumentalities, and while providing technical support and repair services for the Accused Instrumentalities to Cisco's customers.

126. For example, the Accused Instrumentalities utilize the H.265 (or HEVC) video compression standard. For example, the below Cisco website (https://www.cisco.com/c/en/us/products/connected-safety-security/video-surveillance-8000-series-ip-cameras/index.html) states that the Cisco Video Surveillance 8000 Series IP Cameras "employ H.265 technology and can provide higher and more efficient image compression rates than previous H.264 systems." On the same website, "H.265 compression technology" is listed as the second bullet down under "Features and capabilities" following the text "Our 8000 Series IP cameras offer a variety of benefits, including:"



127. The Accused Instrumentalities also employ the H.265 (or HEVC) video compression standards during streaming or network usage, as disclosed below in the following piece of product literature on the Cisco Video Surveillance 8400 IP Camera (https://www.cisco.com/c/dam/en/us/products/collateral/connected-safety-security/video-surveillance-8000-series-ip-cameras/data-sheet-8400.pdf) stating that the camera optimizes "network usage with either H.265, H.264 or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases."

Cisco Video Surveillance 8400 IP Camera

Product overview

The Cisco® Video Surveillance 8400 IP Camera is an outdoor, high-definition, full-functioned video endpoint with an integrated infrared illuminator and industry-leading image quality and processing power. The camera is capable of full 2560 x 1920 (5 MP) resolution and up to 60 frames per second (fps) performance while optimizing network usage with either H.265, H.264, or MJPEG compression. H.265 compression with Smart Stream II provides more efficient image compression rates in comparison with H.264 encoding, by as much as 80 percent in some cases. Contact closures and two-way audio allow integration with microphones, speakers, and access control systems. With its open, standards-based design, the camera shown in Figure 1 provides an ideal platform for integration and operation as an independent device or as part of a Cisco Video Surveillance network.

Figure 1. Cisco Video Surveillance 8400 IP Camera

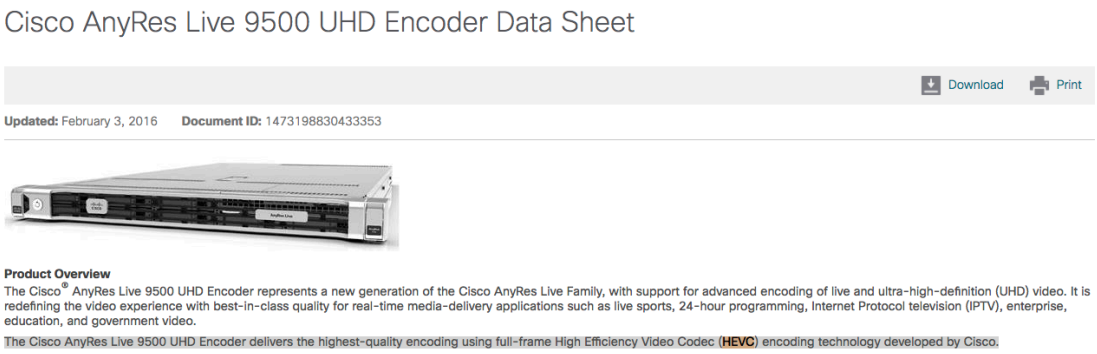
128. Furthermore, a piece of Cisco literature also states that the Cisco collaboration room system products MX700, MX800, MX800 Dual, Cisco Spark Room Kit, Cisco Spark Room Kit Plus, SX80, IX5000, IX5200, "supports…**H.265**" and supports "Video Standards" of "H.265 (SIP [Session Initiation Protocol] only for **H.265**)." *See* https://www.cisco.com/c/dam/en/us/products/collateral/collaboration-endpoints/sales-tool-c96-739424.pdf (pages 2, 4, 5, 8) (emphasis added).

129. Moreover, that same piece of Cisco literature states for the Cisco collaboration room system product SX80 that the "SX80 is a powerful codec platform to build large, custom video-collaboration environments; delivers up to a 1080p60 end-to-end HD video and offers industry first support for **H.265** for future bandwidth efficiencies" (*Id.* at page 4) (emphasis added) and for the Cisco immersive products IX5000 and IX5200, the Cisco IX5000/IX5200 "is the most state-of-the-art triple-screen system combining high fidelity audio/video and rich collaboration functionality for the most vivid immersive collaboration experience possible. As the first single-codec, **H.265** triple-screen product, the [IX5000/IX5200] is both powerful and efficient." (*Id.* at page 8) (emphasis added). "**H.265**" is also listed for the IX5000 and IX5200 as one of the supported "Video Standards," "Video Frame Rate[s]," "Signaling Protocol[s]," and "Bandwidth Consumption" ("Maximum requirement – 1080p, 60fps at 10.8 Mbps (**H.265**)"). *Id.* (emphasis added).

130. Another Cisco website describing the Cisco TelePresence SX80 Codec and product states: "The SX80 delivers up to 1080p60 end-to-end, high-definition (HD) video. It's the first in the industry to offer support for **H.265**, which lays the foundation for future bandwidth efficiencies made possible by the new standard." *See* https://www.cisco.com/c/en/us/products/collaboration-endpoints/telepresence-sx80-codec/index.html. There is also a 2 minute, 36 second video uploaded onto the official "CiscoFrance" Youtube channel entitled "Cisco demonstrates H.265 – high quality video

with great bandwidth efficiency" that describes Cisco's implementation of H.265 in its various products, including the Accused Instrumentalities. *See* https://www.youtube.com/watch?v=QuJSeT0T5tQ.

131. Additional web pages for Cisco products such as the Cisco AnyRes Live encoders list encoders that utilize the High Efficiency Video Codec (HEVC), which is synonymous with H.265. Take for example the "Product Overview" description for the Cisco AnyRes Live 9500 UHD Encoder Data Sheet at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-live/datasheet-c78-734319.html (stating "The Cisco AnyRes Live 9500 UHD Encoder delivers the highest-quality encoding using full-frame **High Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):


Cisco AnyRes Live 9500 UHD Encoder Data Sheet

Download Print

Updated: February 3, 2016 **Document ID:** 1473198830433353

Product Overview

The Cisco® AnyRes Live 9500 UHD Encoder represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live and ultra-high-definition (UHD) video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 9500 UHD Encoder delivers the highest-quality encoding using full-frame High Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

132. A similar Cisco product description that highlights HEVC functionality can be found for the data sheet describing the Cisco AnyRes Live 5300HE at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-live/datasheet-c78-736220.html (stating "The Cisco AnyRes Live 5300HE delivers the highest-quality encoding using Advanced Video Codec (AVC), and with the option, for the first time the capability to encode a stream with **High-Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):

Cisco AnyRes Live 5300HE Data Sheet

Download Print

Updated: December 8, 2015

Product Overview

The Cisco® AnyRes Live 5300HE represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 5300HE delivers the highest-quality encoding using Advanced Video Codec (AVC), and with the option, for the first time the capability to encode a stream with High-Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

133. Another similar Cisco product description that highlights HEVC functionality can be found for the data sheet describing the Cisco AnyRes Live 9400 at https://www.cisco.com/c/en/us/products/collateral/video/videoscape-anyres-live/datasheet-c78-736222.html (stating "The Cisco AnyRes Live 9400 delivers the highest-quality encoding using market-leading H.264 encoding or optionally using full-frame **High-Efficiency Video Codec (HEVC)** encoding technology developed by Cisco.") (emphasis added):

Cisco AnyRes Live 9400 Data Sheet

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Updated: December 8, 2015

Product Overview

The Cisco® AnyRes Live 9400 represents a new generation of the Cisco AnyRes Live Family, with support for advanced encoding of live and high-definition (HD) video. It is redefining the video experience with best-in-class quality for real-time media-delivery applications such as live sports, 24-hour programming, Internet Protocol television (IPTV), enterprise, education, and government video.

The Cisco AnyRes Live 9400 delivers the highest-quality encoding using market-leading H.264 encoding or optionally using full-frame High-Efficiency Video Codec (HEVC) encoding technology developed by Cisco.

134. The Accused Instrumentalities receive the video stream which comprises at least one composite frame (FC), each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format. For example, the coded bitstream when it contains a stereoscopic video in one of the frame packing arrangements such as side-by-side or top-and-bottom or segmented rectangular frame packing format as defined in the following sections of the ITU-T H.265 Series H: Audiovisual and Multimedia Systems, "Infrastructure of audiovisual services –

Coding of moving video" High efficiency video coding ("HEVC Spec"): D.2.16 Frame packing arrangement SEI message syntax, D.3.16 Frame packing arrangement SEI message semantics, D.2.29 Segmented rectangular frame packing arrangement SEI message syntax, D.3.29 Segmented rectangular frame packing arrangement SEI message semantics.

135. The Accused Instrumentalities generate an output video stream which can be reproduced on a visualization apparatus. For example, the output of the decoding process as defined above is a sequence of decoded pictures. *See, e.g.,* HEVC Spec at 3.39 ("3.39 decoded picture: A decoded picture is derived by decoding a coded picture"). Decoded pictures are the input of the display process. *Id.* at 3.47 ("3.47 display process: A process not specified in this Specification having, as its input, the cropped decoded pictures that are the output of the decoding process.").

136. The Accused Instrumentalities receive metadata which determine an area occupied by one of the two images within said composite frame, said metadata indicating either a geometry of the frame packing format or a frame packing type of said composite frame. For example, the HEVC spec provides the default display window parameter to support 2D compatible decoding of stereo formats. *See, e.g.,* HEVC Spec ("NOTE 9 – The default display window parameters in the VUI parameters of the SPS can be used by an encoder to indicate to a decoder that does not interpret the frame packing arrangement SEI message that the default display window is an area within only one of the two constituent frames.").

137. The Accused Instrumentalities determine the area in the composite frame (FC) which is occupied by said one image of the stereoscopic pair within the composite frame based on said metadata. For example, the default display window parameter has been defined to support this application. The parameter syntax is defined in clause E.2.1 VUI parameters syntax, the semantics thereof being described in clause E.3.1 VUI parameters semantics. The usage of the Default Display Window for signaling the 2D

single view in a stereoscopic frame packing format is illustrated in Note 9 of clause D.3.16 and Note 3 in Clause D.3.29 cited above.

138. The Accused Instrumentalities decode only that part of the composite frame which contains said one image to be displayed. For example, tiles are intended to support independent decoding of different picture regions. Clause 7.4.3.2.1 cited above illustrates the process to convert CTB picture scan in CTB tile scan to enable independent decoding of the tile. *See also* HEVC Spec:

> **row_height_minus1**[i] plus 1 specifies the height of the i-th tile row in units of coding tree blocks.
>
> The following variables are derived by invoking the coding tree block raster and tile scanning conversion process as specified in clause 6.5.1:
>
> – The list CtbAddrRsToTs[ctbAddrRs] for ctbAddrRs ranging from 0 to PicSizeInCtbsY − 1, inclusive, specifying the conversion from a CTB address in the CTB raster scan of a picture to a CTB address in the tile scan,
>
> – the list CtbAddrTsToRs[ctbAddrTs] for ctbAddrTs ranging from 0 to PicSizeInCtbsY − 1, inclusive, specifying the conversion from a CTB address in the tile scan to a CTB address in the CTB raster scan of a picture,
>
> – the list TileId[ctbAddrTs] for ctbAddrTs ranging from 0 to PicSizeInCtbsY − 1, inclusive, specifying the conversion from a CTB address in tile scan to a tile ID,
>
> – the list ColumnWidthInLumaSamples[i] for i ranging from 0 to num_tile_columns_minus1, inclusive, specifying the width of the i-th tile column in units of luma samples,
>
> – the list RowHeightInLumaSamples[j] for j ranging from 0 to num_tile_rows_minus1, inclusive, specifying the height of the j-th tile row in units of luma samples.
>
> The values of ColumnWidthInLumaSamples[i] for i ranging from 0 to num_tile_columns_minus1, inclusive, and RowHeightInLumaSamples[j] for j ranging from 0 to num_tile_rows_minus1, inclusive, shall all be greater than 0.
>
> The array MinTbAddrZs with elements MinTbAddrZs[x][y] for x ranging from 0 to (PicWidthInCtbsY << (CtbLog2SizeY − MinTbLog2SizeY)) − 1, inclusive, and y ranging from 0 to (PicHeightInCtbsY << (CtbLog2SizeY − MinTbLog2SizeY)) − 1, inclusive, specifying the conversion from a location (x, y) in units of minimum transform blocks to a transform block address in z-scan order, is derived by invoking the z-scan order array initialization process as specified in clause 6.5.2.

139. The Accused Instrumentalities generate an output frame containing said extracted image. For example, there is an output of the tile decoding process. *See, e.g.,* HEVC Spec at 8.1.1 ("8.1.1 General…Input to this process is a bitstream. Output of this process is a list of decoded pictures.").

140. On information and belief, Cisco also directly infringes and continues to infringe other claims of the '298 Patent, for similar reasons as explained above with respect to Claim 1 of the '298 Patent.

141. On information and belief, all of the Accused Instrumentalities perform

the claimed methods in substantially the same way, e.g., in the manner specified in the HEVC (or H.265) standard.

142. On information and belief, use of the Accused Instrumentalities in their ordinary and customary fashion results in infringement of the methods claimed by the ’298 Patent.

143. On information and belief, Cisco has had knowledge of the ’298 Patent since at least the filing of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the ’298 Patent and knew of its infringement, including by way of this lawsuit. By the time of trial, Cisco will have known and intended (since receiving such notice) that its continued actions would actively induce and contribute to the infringement of the claims of the ’298 Patent.

144. Upon information and belief, Cisco’s affirmative acts of making, using, and selling the Accused Instrumentalities, and providing implementation services and technical support to users of the Accused Instrumentalities, including, e.g., through training, demonstrations, brochures, installation and user guides, have induced and continue to induce users of the Accused Instrumentalities to use them in their normal and customary way to infringe the ’298 by practicing a method for processing a video stream of digital images, the method comprising the steps of: receiving the video stream which comprises at least one composite frame (FC), each composite frame containing a pair of stereoscopic digital images (L,R) according to a predetermined frame packing format; generating an output video stream which can be reproduced on a visualization apparatus, receiving metadata which determine an area occupied by one of the two images within said composite frame (FC), said metadata indicating either a geometry of the frame packing format or a frame packing type of said composite frame (FC); determining the area in the composite frame (FC) which is occupied by said one image of the stereoscopic pair within the composite frame based on said metadata; decoding only that part of the composite frame (FC) which contains said one image to be displayed, and generating an

output frame containing said decoded image. For example, Cisco adopted HEVC (or H.265) as its video codec in its products/services, such as in its surveillance video camera, collaboration room system, immersive and video encoder products. For similar reasons, Cisco also induces its customers to use the Accused Instrumentalities to infringe other claims of the '298 Patent. Cisco specifically intended and was aware that these normal and customary activities would infringe the '298 Patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with the knowledge of the '298 Patent and with the knowledge, or willful blindness to the probability, that the induced acts would constitute infringement. On information and belief, Cisco engaged in such inducement to promote the sales of the Accused Instrumentalities. Accordingly, Cisco has induced and continue to induce users of the Accused Instrumentalities to use the Accused Instrumentalities in their ordinary and customary way to infringe the '298 Patent, knowing that such use constitutes infringement of the '298 Patent. Accordingly, Cisco has been, and currently is, inducing infringement of the '298 Patent, in violation of 35 U.S.C. § 271(b).

145. Cisco has also infringed, and continues to infringe, claims of the '298 Patent by offering to commercially distribute, commercially distributing, making, and/or importing the Accused Instrumentalities, which are used in practicing the process, or using the systems, of the '298 Patent, and constitute a material part of the invention. Cisco knows the components in the Accused Instrumentalities to be especially made or especially adapted for use in infringement of the '298 Patent, not a staple article, and not a commodity of commerce suitable for substantial noninfringing use. Accordingly, Cisco has been, and currently is, contributorily infringing the '298 Patent, in violation of 35 U.S.C. § 271(c).

146. By making, using, offering for sale, selling and/or importing into the United States the Accused Instrumentalities, and touting the benefits of using the Accused Instrumentalities' compression features, Cisco has injured Realtime and is liable

to Realtime for infringement of the '298 Patent pursuant to 35 U.S.C. § 271.

147. As a result of Cisco's infringement of the '298 Patent, Plaintiff Realtime is entitled to monetary damages in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco, together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, Plaintiff Realtime respectfully requests that this Court enter:

a. A judgment in favor of Plaintiff that Cisco has infringed, literally and/or under the doctrine of equivalents, the '535, '477, '442, '907, '777 and '298 patents (the "asserted patents" or "patents-in-suit");

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

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

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

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

DEMAND FOR JURY TRIAL

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

Dated: September 4, 2018

Respectfully submitted,

By: /s/ *Reza Mirzaie*

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing document was served on all counsel of record via electronic service on September 4, 2018.

/s/ *Reza Mirzaie*