

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

HULU, LLC,
AMAZON.COM, INC., and
NETFLIX, INC.,
Petitioners,

v.

REALTIME ADAPTIVE STREAMING LLC,
Patent Owner.

Case No. IPR2018-01187

Patent 9,769,477

PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 9,769,477

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EXHIBIT LIST

Exhibit No.	Description
1001	U.S. Patent No. 9,769,477 to Fallon <i>et al.</i> (“the ’477 Patent”)
1002	Prosecution File History for the ’477 Patent
1003	Declaration of Dr. James A. Storer
1004	Japanese Patent Application Publication No. H11331305 to Imai <i>et al.</i> (“Imai”).
1005	Certified English Translation of Imai
1006	U.S. Patent No. 6,507,611 to Imai <i>et al.</i> (“Imai ’611”)
1007	European Patent Application Publication No. EP0905939A2 to Pauls <i>et al.</i> (“Pauls”)
1008	Excerpt from William Pennebaker <i>et al.</i> , JPEG Still Image Data Compression Standard (Van Nostrand Reinhold, 1993)
1009	Andreas Spanias <i>et al.</i> , <i>Audio Signal Processing and Coding</i> (John Wiley & Sons, Inc., 2007)
1010	Raymond Westwater <i>et al.</i> , <i>Real-Time Video Compression Techniques and Algorithms</i> (Kluwer Academic Publishers, 1997)
1011	David Salomon, <i>A Guide to Data Compression Methods</i> (Springer-Verlag New York, Inc., 2002)
1012	Le Gall, <i>MPEG: A Video Compression Standard for Multimedia Applications</i> (April 1991)
1013	Memorandum Opinion and Order, <i>Realtime Data, LLC v. Rackspace US, Inc. et al.</i> , No. 6:16-CV-00961, Dkt. 183 (E.D. Tex. June 14, 2017)
1014	Memorandum Opinion and Order, <i>Realtime Data, LLC v. Actian Corp. et al.</i> , No. 6:15-CV-00463, Dkt. 362 (E.D. Tex. July 28, 2016)
1015	U.S. Patent No. 5,873,065 to Akagiri <i>et al.</i>
1016	International PCT Patent Application Publication No. WO 98/40842 to Chao <i>et al.</i> (“Chao”)
1017	Notice of Interested Parties, <i>Realtime Adaptive Streaming, LLC v. Hulu LLC</i> , No. 2:17-CV-07611, Dkt. 18 (C.D. Cal. October 24, 2017)
1018	Mark Nelson, <i>The Data Compression Book</i> , M&T Books, 1991 (“Nelson”)

Exhibit No.	Description
1019	J. Golston, <i>Comparing media codecs for video content</i> , Embedded Systems Conference, San Francisco, 2004.
1020	International Telecommunication Union Telecommunication Standardization Sector Recommendation H.263 (February 1998) (H.263 Standard)
1021	U.S. Patent No. 6,195,024 to Fallon (incorporated by reference into the '610 Patent)
1022	International PCT Application Publication WO 00/51243 to Park
1023	Declaration of Dr. Sylvia Hall-Ellis
1024	Report and Recommendation of U.S. Magistrate Judge, <i>Realtime Data, LLC v. Packeteer, Inc.</i> , Case No. 6:08-CV-144, Dkt. 379 (E.D. Tex. June 23, 2009)

I. INTRODUCTION

Petitioners Amazon.com, Inc., Hulu, LLC and Netflix, Inc. request *inter partes* review of Claims 1–6, 9–14, 20–22, and 25–27 of U.S. Patent No. 9,769,477 (Ex. 1001). The '477 Patent claims known compression concepts, such as selecting data compression encoders based on a throughput of a communications channel and utilizing asymmetric data compression encoders.

Prior art, including the Imai and Pauls references, taught selecting data compression encoders based on throughput no later than 1999, well before the '477 Patent was filed in 2001. Imai's data transmission system selects asymmetric compression algorithms based on a determined throughput of the transmission channel. Pauls' adaptive communication data formatting system also accounts for the nature and speed of the network in selecting from a variety of asymmetric video transcoders. Both references teach selecting asymmetric compression algorithms for use. Moreover, arithmetic encoders, like those taught by the Chao reference, were known in the art. The challenged claims are invalid in light of Imai, Pauls and/or in combination with Chao.

II. GROUNDS FOR STANDING

Petitioners certify that the '477 Patent is eligible for *inter partes* review. Petitioners further certify that they are not barred or estopped from requesting this *inter partes* review.

III. IDENTIFICATION OF CHALLENGE

A. Priority

The application that led to '477 Patent was filed October 6, 2015 as U.S. Patent Application No. 14/876,276 and claims priority to U.S. Provisional Patent Application No. 60/268,394, which was filed February 13, 2001. Petitioners are not aware of any claim by the Patent Owner that the '477 Patent is entitled to a priority date earlier than February 13, 2001.

B. Relied Upon Prior Art¹

Exhibit 1004 – Japanese Patent Application Publication No. H11331305 (“Imai”) is prior art under at least pre-AIA §§102(a) and (b) because it published November 30, 1999, which is over one year before the '477 Patent's earliest priority date. *See* §VI.A. (Exhibit 1005 – certified English translation of Imai); (Exhibit 1006 – U.S. Patent No. 6,507,611 (“the Imai '611 Patent”) is the U.S. sibling of Imai).²

Exhibit 1007 – U.S. Patent No. 6,920,150 (“Pauls”) is prior art under at least pre-AIA §102 (e). *See* §VI.B.

¹ Because each claim of the '477 Patent claims priority to an application filed before March 16, 2013, pre-AIA 35 U.S.C. §102 applies. MPEP §2159.02.

² The Imai '611 Patent (Ex. 1006) claims priority to Imai and contains substantively identical figures and disclosures.

Exhibit 1016 – International Patent Application Publication No. WO 98/40842 (“Chao”) is prior art under 35 U.S.C. §§102(a) and (b). *See* §VI.C.

Imai, Pauls, and Chao were neither cited to nor considered during prosecution of the ’477 Patent. Ex. 1001; *see generally*, Ex. 1002.

C. Statutory Grounds

Petitioners request *inter partes* review on the following grounds:

Ground No.	References	Statutory Basis	Claims Challenged
1	Imai (Ex. 1005)	Obviousness (§103)	1, 3–5, 12–14
2	Pauls (Ex. 1007)	Obviousness (§103)	1, 3–6, 9–14
3	Imai (Ex. 1005) Pauls (Ex. 1007)	Obviousness (§103)	1, 3–6, 9–14
4	Imai (Ex. 1005) Pauls (Ex. 1007) Chao (Ex. 1016)	Obviousness (§103)	2, 11, 20–22, 25–27

IV. ’477 PATENT

The ’477 Patent is directed to “compressing and decompressing data based on the actual or expected throughput (bandwidth) of a system employing data compression.” Ex. 1001 at 9:27–31. The ’477 Patent states that “dynamic modification of compression system parameters so as to provide an optimal balance between execution speed of the algorithm (compression rate) and the resulting compression ratio, is highly desirable.” *Id.* at 1:64–67.

The '477 Patent purports to solve “bottlenecks” in the throughput of a system by switching between different compression algorithms applied to data. Ex. 1001 at 10:3–8. The '477 Patent notes that asymmetric algorithms provide “a high compression ratio (to effectively increase the storage capacity of the hard disk) and fast data access (to effectively increase the retrieval rate from the hard disk).” Ex. 1001 at 13:39–45. On the other hand, symmetric routines “compris[e] a fast compression routine.” Ex. 1001 at 14:40–43. In one embodiment, a controller “tracks and monitors the throughput . . . of the data compression system 12.” Ex. 1001 at 10:54–57. When the throughput of the system falls below a predetermined threshold, the system generates control signals to enable/disable different compression algorithms. Ex. 1001 at 10:55–58.

The '477 Patent describes different “popular compression techniques” that were known in the prior art. Ex. 1001 at 5:11. Specifically, the '477 Patent admits that arithmetic compression was known and that arithmetic coding was a “popular compression technique [that] possesses the highest degree of algorithmic effectiveness.” Ex. 1001 at 5:11–12.

The '477 Patent also admits that content-dependent compression, as recited in claims 10 and 11, was well-known in the prior art. The '477 Patent incorporates into its specification the disclosure of US Patent No. 6,195,024 (“the '024 Patent”)—a patent with an application filing date in 1998. Ex. 1001 at 5:45–50;

Ex. 1021 Face. The '024 Patent admits that “there are many conventional content dependent” compression techniques in the prior art and even presents the below “diagram of a content dependent high-speed lossless data compression and decompression system/method according to the prior art.” Ex. 1021 at 5:54–56, 2:41–45.

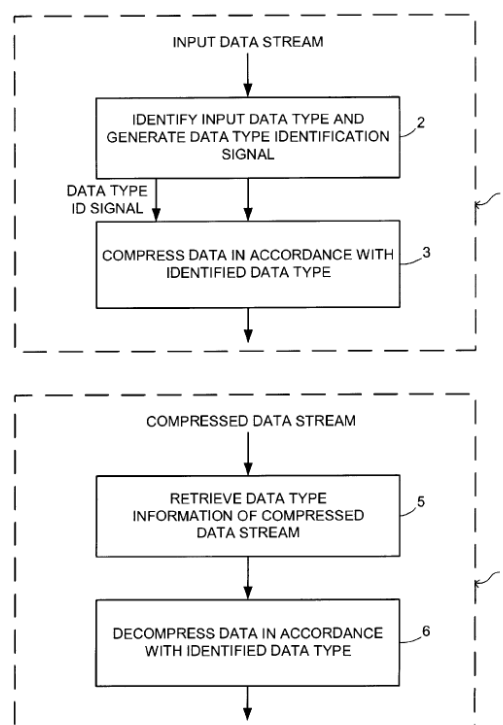


FIG. 1
PRIOR ART

Here, the '024 Patent describes a system that identifies an input data type and compresses the data in accordance with the identified data type. Thus, the '024 Patent, as incorporated by reference into the disclosure of the '477 Patent, admits that (a) content-dependent compression amounts to merely compressing data with

an algorithm based on a data type, and (b) content-dependent compression was well-known in the prior art.

Petitioners are not aware of any objective evidence of non-obviousness for the challenged claims of the '477 Patent.

V. CLAIM CONSTRUCTION

To the extent the Applicant has defined a claim term in the specification, Petitioners have used that definition. For the purpose of deciding the grounds of invalidity presented by this petition,³ the following terms should be construed: “asymmetric data compression encoder[s]” and “data blocks.”

A. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) as of February 13, 2001 would have a bachelor’s degree in electrical engineering, computer science, or a similar field with at least two years of experience in data compression or a person with a master’s degree in electrical engineering, computer science, or a similar field with a specialization in data compression. Ex. 1003 at 65. A person with less education but more relevant practical experience may also meet this standard. Ex. 1003 at 65.

³ None of the claim construction issues that are necessary to resolve the invalidity grounds presented by this petition differ based upon the application of broadest reasonable interpretation versus the district court-type claim construction standards. Ex. 1003 at 88.

B. Claim Terms

1. “asymmetric data compression encoder[s]”

A POSITA would have understood that the term “asymmetric data compression encoder(s)” means “an encoder(s) configured to utilize a compression algorithm in which the execution time for the compression and decompression routines differ significantly” in view of the specification. *See* Ex. 1003 at 89-90. Although the ’477 Patent does not describe an “asymmetric data compression encoder,” it provides an express definition for an “asymmetrical data compression algorithm.” The ’477 Patent states “[a]n asymmetrical data compression algorithm is referred to herein as one in which the execution time for the compression and decompression routines differ significantly.” *See, e.g.*, Ex. 1001 at 10:12–23.

Moreover, the specification gives examples of asymmetric and symmetric algorithms, stating that “dictionary-based compression schemes such as Lempel-Ziv” are asymmetric, while “table-based compression schemes such as Huffman” are symmetric. Ex. 1001 at 10:19–20 & 10:24–25.

Accordingly, the Board should find that “asymmetric compression algorithm” means “a compression algorithm in which the execution time for compression and decompression differ significantly.” Ex. 1003 at 89-90.

2. “data blocks”

A POSITA would have understood that “data block,” in the context of the specification, means “a unit of data comprising more than one bit.” *See* Ex. 1003 at 91-94. First, “data block” is used consistently in the claims to refer to a unit of data that is compressed by a compression algorithm. Ex. 1001 at 21:57–22:66, cls. 1, 9, 19, and 25. The specification further explains that “[d]ata compression is widely used to reduce the amount of data required to process, transmit, or store a given quantity of information,” which indicates that a data block must be a unit large enough for there to be a chance to realize a reduction in size through compression Ex. 1001 at 2:52–54; Ex. 1003 at 91. The smallest unit of digital data representation is a bit, and the information contained in a single bit cannot be represented through compression with fewer bits. Ex. 1003 at 91. Therefore, a data block must be more than one bit in length so that it can be compressed as claimed. Ex. 1003 at 91.

The ‘477 patent specification also supports this construction. It describes “block structured disk compression” as operating on blocks of data that are either “fixed” or “variable in size.” Ex. 1001 at 7:19–21. The specification states that data blocks can represent files, and that “[a] single file usually is comprised of multiple blocks, however, a file may be so small as to fit within a single block.” Ex. 1001 at 7:21–23. Also, the specification goes on to discuss the pros and cons

of smaller and larger data block sizes. Ex. 1001 at 7:25–39. It also contemplates units of data that comprise more than one bit that are stored in its system. Ex. 1001 at FIG. 4B (stating “2 bits” are reserved for a sector map “type” definition, and “3 bits” are reserved for “c type”). The specification’s discussion of various data block sizes, including file-sized data blocks and data units as small as 2 bits, are consistent with Petitioner’s proposed construction.

The ’477 Patent incorporates by reference U.S. Patent No. 6,195,024 (“the ’024 Patent”) which uses the term “data block” in a consistent manner:

It is to be understood that the system processes the input data streams in data blocks that may range in size from individual bits through complete files or collections of multiple files. Additionally, the data block size may be fixed or variable. The counter module [] counts the size of each input data block (i.e., the data block size is counted in bits, bytes, words, any convenient data multiple or metric.

Ex. 1021 at 7:9–15. In district court proceedings, the Patent Owner⁴ has twice stipulated to a similar construction of this term. Ex. 1013 at 34; Ex. 1014 at 40 (both evidencing Patent Owner’s agreement that “data block” means “a single unit of data, which may range in size from individual bits through complete files or

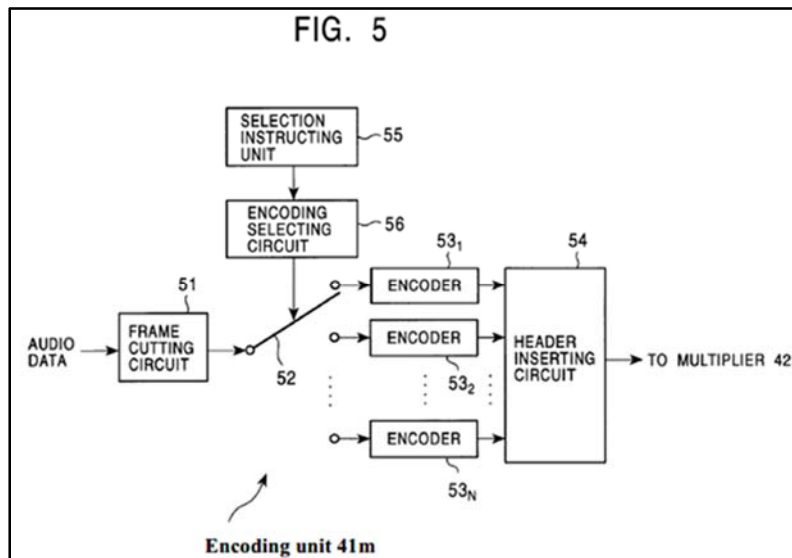
⁴ The entity in those proceeding is Realtime Data, LLC rather than Realtime Adaptive Streaming LLC, the Patent Owner here. Ex. 1017.

collection of multiple files”). Thus, the Patent Owner’s use of the term in litigation supports Petitioner’s construction.

VI. PRIOR ART

A. Overview of Imai (Ex. 1005)

Imai is a Japanese Patent Application Publication filed by Sony. Ex. 1005. Imai is directed to encoding digital data for transmission over a network using real-time decompression and reproduction at a client by selecting an appropriate encoder, from a plurality, based on various factors including the detected throughput of a network. Ex. 1005 at [0001], [0005], [0067]–[0068], [0100]–[0101], Solution means. After receiving a request for digital data from a client, Imai’s “frame cutting circuit” cuts the requested digital data into “units of frame” having a length that is suitable for coding or for transmission on a network. *Id.* at [0130], [0066]. Imai’s “units of frame” are units of data bits or digital data blocks on which Imai’s compression and transmission system operates. Ex. 1003 at 97.



Switch 52 supplies each individual digital data “frame” output from the frame cutting circuit to a selected one of a plurality of available encoders 53_1 to 53_N . Ex. 1005 at [0066]. Selection instructing unit 55 selects an appropriate “one from a plurality of coding methods corresponding to the encoders 53_1 to 53_N . . . and then instructs the encoding selecting circuit 56 to select the decided coding method.” *Id.* at [0070]. Imai’s encoders are configured to utilize asymmetric compression algorithms including the MPEG audio layers 1, 2, and 3. Ex. 1005 at [0067]; *see* Ex. 1010 at 7 (stating that MPEG layer 3 is an asymmetric compression algorithm); Ex. 1003 at 98.

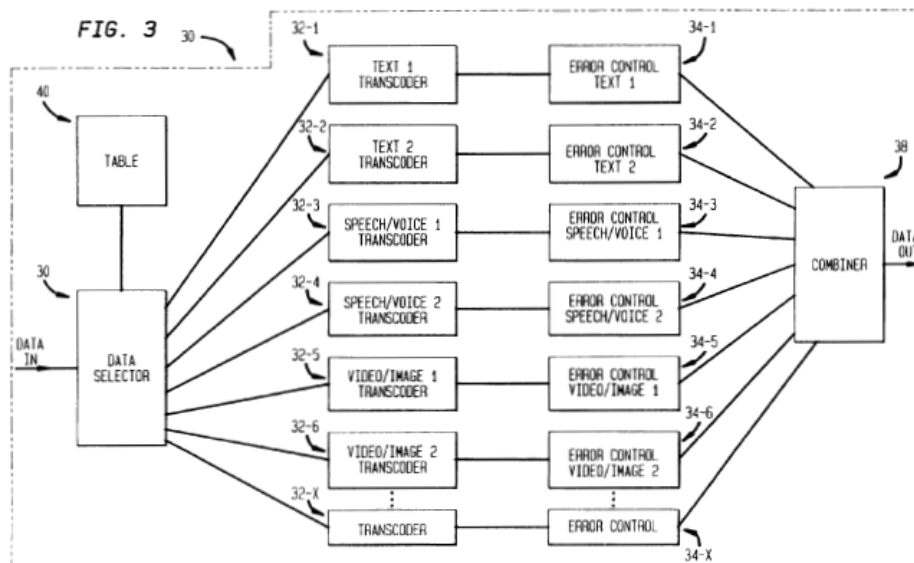
Imai’s “selection instructing unit” analyzes various factors to decide which compression algorithm to select and apply to each individual data frame. For example, Imai teaches assessing client processing ability by analyzing the client’s processing of “dummy data packets” to determine client resources that are

“employed for [] other process[es]” and resources that are available. Ex. 1005 at [0099]–[0100]. Imai’s selection instructing unit also determines characteristics of the uncompressed data and selects a compression algorithm accordingly. *Id.* at [0102]. The selection instructing unit accounts for these variations in selecting a suitable coding method. *Id.* Imai additionally describes a detailed process for deriving a transmission rate of a network communication channel by timing the transmission and receipt of data packets between the client and server. *Id.* at [0149]–[0150].

While some of Imai’s embodiments are directed to audio coding, Imai explains that its “invention is also applicable to other signals such as video signals, other types of time series signals” Ex. 1005 at [0172]. Thus, Imai’s teachings that are not limited to audio, but apply more generally to selecting and applying various encoders based on specific data parameters, regardless of the target data set for each underlying algorithm (*e.g.*, audio or voice). It would have been well-known to a POSITA at the relevant time that audio, video, and image compression techniques were related and it would have been common for a POSITA to consult and utilize teachings from these related data types, even without Imai’s explicit suggestion to do so. Ex. 1003 at 147.

B. Overview of Pauls (Ex. 1007)

Pauls is a European Patent Application Publication that published in 1999 and was assigned to Lucent Technologies. Pauls is directed to “improving data transfer performance over communications networks connecting data networks and users using adaptive communications formatting.” Ex. 1007 at Abstract. Pauls explains that adaptive communications formatting involves “encoding (or compressing)” data to “reduce the amount of data being transmitted” using “transcoding techniques.” *Id.* at [0003]. Like Imai, Pauls teaches selecting one from a plurality of encoders based on various data parameters, such as the throughput of a communication channel. Pauls has extensive teachings on selecting between different asymmetric video encoders. *Id.* at [0009]–[0010], [0012], FIG. 3.



Pauls teaches that the particular transcoders applied are selected based upon factors such as the “nature of the communications network,” the type of data being transmitted, and the preferences of the user. *See id.* at [0003]. For the nature of the communications network, Pauls teaches a relevant factor is “the available bandwidth” and the “bit rate” of the network. *Id.* at [0013].

Pauls teaches that a system may have more than one video/image transcoder. *See* FIG. 3. Pauls explains that different transcoders are more effective than others for particular data types. *Id.* at 0017. For example, Pauls teaches that the input video may be in an MPEG or MPEG2 format, and that H.263 may be an effective transcoding technique. *Id.* at [0017], [0024], & FIG. 5. Furthermore, H.263 had the option of forming the compressed video data using an arithmetic compression algorithm. Ex. 1020 at 69–76.

In one embodiment, Paul teaches that “[t]he communication network 16 connects the user 14 to the access server 20 . . . [and u]pon connecting to the access server 20, the user 14 can retrieve data from the host 22.” Ex. 1007 at [0006]. Pauls teaches “[t]he data (or file) is retrieved via a bitstream from the host 22 to the access server 20 to the user 14.” *Id.* at [0008]. Pauls teaches that “[a]t the access server 20, the data is formatted using a mixture of transcoding techniques and error control schemes to facilitate data transmission within acceptable quality levels.” *Id.* at [0008].

C. Overview of Chao (Ex. 1016)

Chao is an International Patent Application that published in 1998. Chao teaches a compression system for compressing video or image data employed in “‘video on demand’ systems, such as video servers” for “streaming video” in “real-time.” Ex. 1016 at 4:29–35. Chao’s video data is compressed using an entropy coding technique of either “arithmetic, run length, or Huffman encoding.” *Id.* at 7:5–8. Chao also teaches having a particular entropy compression algorithm applied where it is “selected at run-time by the user, based on the desired compression ratio and the amount of time required to get the selected level of compression.” *Id.* at 14:19–25.

VII. CHALLENGED CLAIMS

A. Ground 1: Claims 1, 3–5, and 12–14 are Obvious in View of Imai

A POSITA would have found Claims 1, 3–5, and 12–14 are obvious in view of her own knowledge and the teachings of Imai. Ex. 1003 at 111.

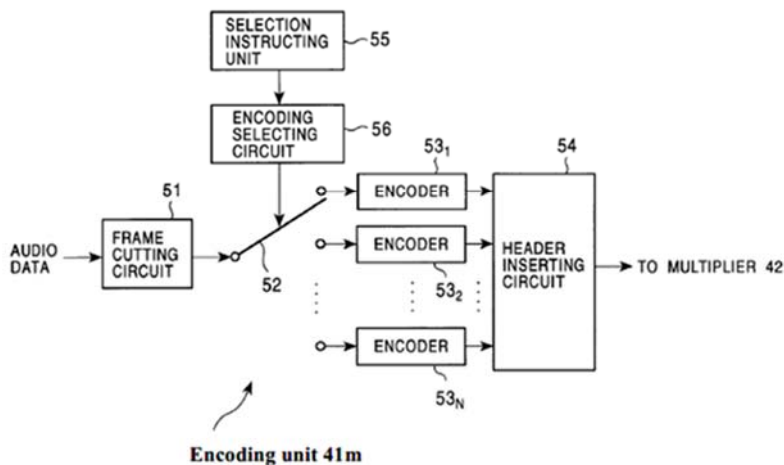
1. Independent Claim 1 is Obvious

Claim 1 includes a preamble directed to “[a] system.” To the extent the preamble is a limitation, it is met because Imai teaches “a transmission system” for compressing data. Ex. 1005 at [0050], [0051]; Ex. 1003 at 112.

1[a] 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,

Imai teaches this limitation. Imai teaches “a plurality of coding methods corresponding to the encoders 53₁ to 53_N.” Ex. 1005 at [0070]. Imai’s encoders 53₁ to 53_N employ “different coding methods from each other” and are thus different encoders. Ex. 1005 at [0067]; Ex. 1003 at 113.

FIG. 5



Ex 1005 at [0067]. Imai teaches that the coding methods employed by each encoder include:

linear PCM (Pulse Code Modulation), ADPCM (Adaptive Differential PCM), layers 1, 2, 3 of MPEG (Moving Picture Experts Group), ATRAC (Adaptive Transform Acoustic Coding), ATRAC 2, and HVXC (Harmonic Vector Excitation Coding). Stated otherwise,

in the embodiment, the encoders 53₁ to 53_N are prepared by using encoders which perform encoding of the audio signal with various coding methods.

Ex. 1005 at [0067], [0068]–[0071]. At least MPEG layers 1, 2, and 3, ATRAC, and ATRAC 2 are each data compression algorithms. Ex. 1003 at 114; *see* Ex. 1015 2:25–34 (describing ATRAC compression); Ex. 1022 at 4:19–21 (describing audio MPEG layers 1, 2, and 3 compression); Ex. 1005 at [0068] (stating that MPEG layer 3 and ATRAC 2 provide a high compression rate). A POSITA would have understood that Imai’s “encoders” are data compression encoders that employ or use different data compression methods or algorithms because these algorithms use less bits to represent the input data stream. Ex. 1003 at 115-116.

Imai’s encoders comprise a plurality of different *asymmetric* data compression encoders that utilize data compression algorithms. Ex. 1005 at [0067]; Ex. 1003 at 117-118. Specifically, MPEG layers 1, 2, and 3, and the ATRAC and ATRAC 2 compression algorithms are each different asymmetric data compression algorithms that are each used by Imai’s encoders. Ex. 1003 at 117.

The ATRAC family of compression algorithms, including the ATRAC 2 compression algorithm, use an asymmetric architecture that separates the implementation details of the encoder (such as psychoacoustic analysis and bit-allocation) from the decoder. Ex. 1003 118; Ex. 1009 at 81. This architecture

allows for more sophisticated encoding strategies which are performed with access to higher performance computing resources (*e.g.*, a computing device or special purpose recording/encoding device) without modifying the complexity of the decoding strategies, which are typically performed with less sophisticated implementations. Ex. 1003 at 118; Ex. 1009 at 81. These aspects of asymmetric algorithms (including the ATRAC compression algorithm) are advantageous for and contributes to their use in inexpensive decoder implementations such as the Sony MiniDisc player. Ex. 1003 at 119; Ex. 1009 at 80–82.



ATRAC 2 is also built on this asymmetric architecture and is therefore also an asymmetric data compression algorithm. Ex. 1003 at 120. The MPEG family of audio compression algorithms, including MPEG layers 1, 2, and 3, is built on a similar architecture where the compressor executes a slow, complex algorithm whereas the decompression algorithm is simple. Ex. 1003 at 120; Ex. 1009 at 81; Ex. 1011 at 11; *see* Ex. 1010 at 7. This explains why MPEG layer 3 is “a natural choice when audio files are compressed into an archive, where they will be

decompressed and used very often.” Ex. 1003 at 120-121; Ex. 1011 at 11. Thus, Imai’s disclosure of a configuration of a plurality of different coding methods is a plurality of different asymmetric data compression algorithms. Ex. 1005 at [0067]; Ex. 1003 at 121. With this disclosure, a POSITA would have understood that each of the ATRAC and MPEG compression algorithms are asymmetric compression algorithms. Ex. 1003 at 118-120; Ex. 1009 at 81; Ex. 1010 at 7; Ex. 1011 at 11.

Imai explains that its invention is equally applicable to video. Ex. 1005 at [0172]. A POSITA would have known to configure Imai’s compression and transmission teachings with a plurality of different encoders configured to utilize one or more asymmetric data compression algorithms because video is an “asymmetric application” that realizes the same benefits from compression with asymmetric encoders and algorithms as other media, such as audio. Ex. 1003 at 122-123; Ex. 1012 at 5. For instance, the MPEG family of audio compression algorithms, discussed above, uses a slow, complex algorithm for compression and a simpler algorithm for decompression. Ex. 1003 at 120; Ex. 1009 at 81; Ex. 1010 at 7.

Given the benefits explained above, a POSITA would have been motivated to configure Imai’s encoding system with a plurality of MPEG encoders to realize these benefits in its digital distribution system. Ex. 1003 at 123. First, Imai teaches that “the present invention is also applicable to other signals such as video

signals.” Ex. 1005 at [0172]. Second, incorporating video encoders was well within the skill of a POSITA because audio and video applications frequently overlapped, and many encoder technologies handled both. Ex. 1003 at 122-123. Notably, the ’477 Patent refers to “speech, music, audio, images and video” collectively as “continuous information” (Ex. 1001 at 2:28) but does not distinguish between using audio and video compressors. Ex. 1003 at 79-81. In fact, the detailed description of the ’477 Patent uses the word “audio” only once, and related U.S. Patent 8,934,535 has claims directed to “audio and video” that purport to be supported by the same specification. *See generally* Ex. 1001.

Accordingly, Imai teaches this element. Ex. 1003 at 113-123.

1[b] 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

Imai renders this limitation obvious. Ex. 1003 at 124-147. As discussed above, Imai teaches using a plurality of asymmetric data compression encoders 53₁ to 53_N. *See* §VII.A.1, 1[a]. It would have been obvious to a POSITA that a first encoder of a plurality of asymmetric data compression encoders in Imai would compress data blocks at a higher data compression rate than a second encoder for several reasons. The ’477 Patent uses the term “data compression rate” to refer to the execution or algorithmic speed of a compression encoder. Ex. 1001 at 2:63–

67; 8:10–18; 14:11–38; Ex. 1003 at 124. In other words, it is the throughput of the asymmetric data compression encoder measured by the amount of input data that it can compress per unit of time at a given compression ratio. Ex. 1003 at 124. A POSITA would have understood that it is only a remote possibility that any two different asymmetric data compression encoders would have the same execution speed, and therefore the obvious result of including two or more different asymmetric compression encoders is that one encoder would have a higher data compression rate than another encoder. Ex. 1003 at 132, 137.

Moreover, Imai teaches including asymmetric compression encoders that have different execution speeds. For example, Imai teaches using an ATRAC encoder and explains how it is a relatively faster compression algorithm: “[o]ne example of the coding method, which requires a not so large amount of computation for decoding, is ATRAC.” Ex. 1005 at [0068]; Ex. 1003 at 138-139. Thus, a POSITA would have expected that such an encoder would produce compressed data at a higher data compression rate. Ex. 1003 at 139.

In addition, Imai compares and contrasts different asymmetric data compression encoders in terms of their “compression rate,” and identifies several asymmetric data compression algorithms that “provide[] a high *compression rate*,” referring to MPEG layer 3 and ATRAC 2 as “example[s].” Ex. 1005 at [0068]. This passage teaches a plurality of asymmetric data compression encoders that

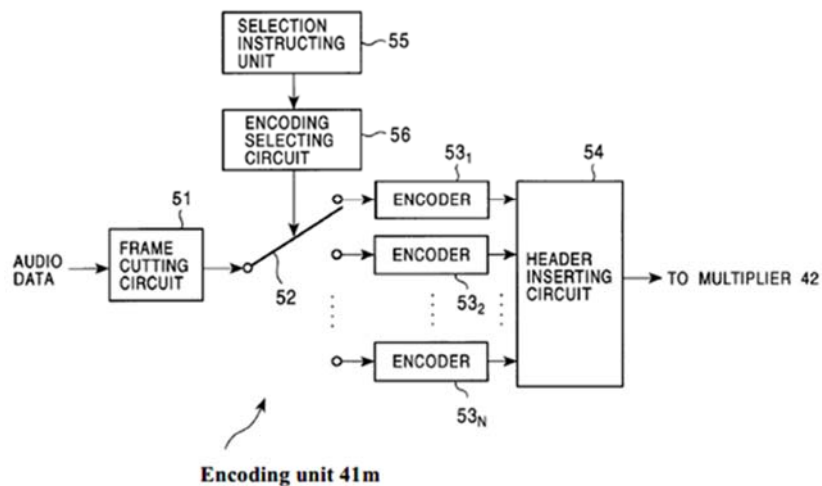
include a first encoder that uses an asymmetric compression algorithm (MPEG layer 3) and is configured to compress data at a higher compression rate than a second encoder using another asymmetric algorithm (ATRAC 2). Ex. 1005 at [0068]–[0067]. Imai explains that ATRAC 2 can encode at various compression rates (*e.g.*, “64 Kbps, 32K bps, 24 Kbps”). Ex. 1005 at [0069]; Ex. 1003 at 139, 142. A POSITA would have appreciated from Imai’s various teachings that the different asymmetric data compression encoders have different data compression rates, with some encoders having higher rates than others. Ex. 1003 at 138-139.

A POSITA would have also found it obvious to select among different encoders having higher and lower data compression rates to better match the incoming data stream to the throughput of the communication channel. Ex. 1003 at 143. Imai explains that the transmission rate of a communication channel between the server and client “varies due to the amount of traffic” being sent across the channel, and that this can impact the ability of the client to reproduce the transmitted signals in real-time. Ex. 1005 at [0145]; Ex. 1003 at 143. Accordingly, Imai selects a “coding method which can provide the coded data having a bit rate not higher than the detected transmission rate.” Ex. 1005 at [0146], Abstract; Ex. 1003 at 143. A POSITA would have recognized that adjusting the output rate of the compression encoder would impact the throughput

of the compression encoder, particularly if the compression ratio of the encoder is fixed. Ex. 1003 at 143.

Imai also teaches that its asymmetric data compression encoders are configured to compress data blocks. In Imai, a client requests signals from a server. Ex. 1005 at [0086]. FIG. 5 depicts the compression system at the server:

FIG. 5



After receiving a request for signals, data blocks are framed from the data input into Imai's server through its frame cutting circuit. Ex. 1005 at [0066]. Imai teaches that the frame cutting circuit:

cuts the audio signal (audio data) from the audio signal input circuit 31 in units of frame having a predetermined length (e.g., a length suitable for coding made by encoders 53₁ to 53_N, or a length suitable for packet (network packet) transmission via the network 2), and then supplies resulting frames to a switch 52.

Ex. 1005 at [0066]. Thus, Imai's frame cutting circuit receives digital data requested by the client and "cuts" the digital data into data blocks of a length suitable for compressing or for creating network transmission packets. Ex. 1003 at 145. Each "unit of frame" is a data block. Ex. 1003 at 145.

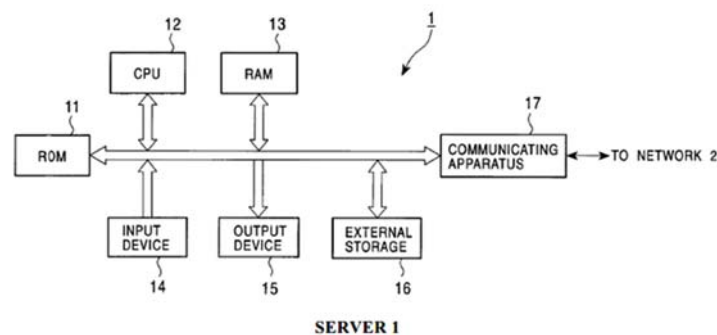
While the passage refers to audio data, it would have been obvious to perform the step using data blocks containing video, based upon the POSITA's knowledge and Imai's express teaching that video signals could be substituted for audio signals. In particular, Imai explains that "while *audio signals* are processed in the illustrated embodiment, the present invention is also applicable to other signals, such as *video signals*, other types of time-series signals, and signals being not in time series." Ex. 1005 at [0172]; Ex. 1003 at 146. This teaching of Imai would have suggested to a POSITA what was already obvious—that while the embodiments in Imai use digital audio data as an example, Imai's teachings present a framework for compressing many types of digital data. Ex. 1003 at 146. A POSITA would have understood that video, image, or other data-specific compression algorithms could be included with or in place of the various generic audio encoders and compression algorithms that Imai teaches. Ex. 1003 at 146. This is in part because audio, video, and image compression techniques were intrinsically related. Ex. 1003 at 146. For example, both have benefited from

similar underlying technology such as mathematical transforms, and standard video compression encoders included audio compression encoders since audio is an integral part of most video content. Ex. 1003 at 147. For example, MPEG audio layers 1, 2, and 3, which are audio compression algorithms explicitly referenced by Imai, were developed as a part of video compression standard projects that pre-date the '477 Patent (the MPEG1 standard). Ex. 1003 at 147. It would have been common for a POSITA to readily consult and utilize teachings from these related techniques, even without Imai's explicit suggestion to do so. Ex. 1003 at 147.

1[c] one or more processors configured to:

Imai teaches this limitation. Ex. 1003 at 148-149. Imai teaches that its “CPU 12 decides which one of the coding methods executed in the encoders 53₁ to 53_n is used.” Ex. 1005 at [0100]. A POSITA would have understood that Imai's CPU is a controller that is configured to execute the compression and transmission functions of the server. Ex. 1003 at 148.

FIG. 2



1[d] 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

Imai teaches this limitation. Ex. 1003 at 150-153. Imai recognizes that the transmission rate of the communication channel used to transmit the coded data from server to client “varies due to the amount of traffic” being sent across the channel, and that this can impact the ability of the client to reproduce the transmitted signals in real-time. Ex. 1005 at [0145]; Ex. 1003 at 150; *see* §VII.A.1, 1[b]. Accordingly, Imai selects a “coding method which can provide coded data having a bit rate not higher than the detected transmission rate.” Ex. 1005 at [0146], Abstract; Ex. 1003 at 151.

Specifically, Imai describes a process for deriving a “transmission rate B (bps) of the network” used to transmit compressed digital data. Ex. 1005 at [0149]. The “transmission rate” of the network in Imai is a measure of a throughput of a communication channel. Ex. 1003 at 152. Imai derives the transmission rate of the network using the time it takes to transmit a data packet having a known size across the network. Ex. 1005 at [0149]–[0150]; Ex. 1003 at 152-153; *see* Ex. 1005 at [0150]–[0153]. Imai teaches that the transmission rate is determined periodically throughout transmission of the requested data, and that the encoding method is selected to “provide the coded data having a bit rate not higher than the detected transmission rate of the network.” Ex. 1005 at [0146], [0152], [0154]–

[0160]; Ex. 1003 at 153. The determined transmission rate of the network is a data parameter relating to a throughput of the communication channel or network, and Imai measures this determined data parameter in bits per second. Ex. 1003 at 151-153.

<p>1[e] 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.</p>

Imai teaches this limitation. Ex. 1003 at 154. Imai teaches a selection instructing unit 55 that selects an appropriate “one from a plurality of coding methods corresponding to the encoders 53₁ to 53_N . . . and then instructs the encoding selecting circuit 56 to select the decided coding method.” Ex. 1005 at [0070]. As discussed above, Imai’s encoders include a plurality of different asymmetric data compression encoders. *See* §VII.A.1, 1[a]; Ex. 1003 at 154. Imai teaches selecting one or more of those asymmetric data compression encoders based on the determined data parameters, one of which is the throughput of the communications channel discussed. *See* §VII.A.1, 1[d]. Ex. 1003 at 154.

Imai recognizes that the transmission rate of the communication channel used to transmit the coded data from server to client “varies due to the amount of traffic” being sent across the channel, and that this can impact the ability of the

client to reproduce the transmitted signals in real-time. Ex. 1005 at [0145]; Ex. 1003 at 154.

Thus, in view of the above problem, the server 1 is designed to detect the transmission rate of the network 2 at the time of transferring data between the server 1 and the client terminal 3, and to change the encoding schedule so as to include the coding method which can provide the coded data having a bit rate not higher than the detected transmission rate of the network 2.

Ex. 1005 at [0146]. Thus, Imai teaches selecting an asymmetric data compression encoder from a plurality based on a determined data parameter that relates to throughput to ensure the output from the encoder has an acceptable bit rate. Ex. 1005 at [0146], [0152], [0154]–[0160]; Ex. 1003 at 154.

2. Dependent Claims 3 and 4 are Obvious

3	The system of claim 1, wherein the throughput of the communications channel comprises: an estimated throughput of the communications channel.
4	The system of claim 1, wherein the throughput of the communications channel comprises: an expected throughput of the communications channel.

Imai renders obvious Claim 1 (*see* §VII.A.1) and the additional limitations of Claims 3 and 4. Ex. 1003 at 155-158. As discussed above, Imai teaches determining a data parameter relating to a throughput of a communications

channel, and specifically teaches deriving a transmission rate of a network. *See* §VII.A.1, 1[d]. Moreover, Imai’s determined transmission rate is an “*estimated* value of the transmission rate.” Ex. 1005 at [0151]. The “estimated value of the transmission rate” is a data parameter that estimates the throughput of the communications channel. Ex. 1003 at 156.

Imai also explains that its transmission rate can be estimated in several ways, including an estimate that accounts for “a period of time from the time when the server 1 receives the request from the client terminal 3 to the time when it transmits the data in response to the request, and a period of time from the time when the client terminal 3 receives the data from the server 1 to the time when it transmits the next request are ignored,” Ex. 1005 at [0151]. According to Imai, using the lower estimate provides for a margin in case the bit rate of the coded data exceeds the estimated transmission rate. Ex. 1005 at [0151]; Ex. 1003 at 156. Using this throughput estimate, Imai selects a data compression encoder to apply in transmitting data across the communication channel. *See* §VII.A.1, 1[e].

Imai also teaches the use of a “Resource Reservation Protocol” that allocates some minimum amount of “reserved band[width]” until disconnection of the communication link. Ex. 1005 at [0145], [0162]; Ex. 1003 at 157. According to Imai, use of this protocol provides an expected throughput of the network so that the encoder can be selected accordingly during the reservation period. Ex. 1005 at

[0162]. Thus, Imai teaches selecting a data compression encoder to apply based on an expected throughput of the communication channel.

To the extent that Patent Owner argues that Imai teaches only “estimated throughput” but not “expected throughput,” or vice versa, the alternative would have been obvious given the teachings of Imai and the knowledge of a POSITA. This is because Imai’s throughput estimate is also an expected value of the transmission rate or throughput of the communication channel at a future time that is used to inform the selection of a data compression encoder that will output data at that time. Ex. 1003 at 158.

Accordingly, Imai teaches this element. Ex. 1003 at 155-158.

3. Dependent Claim 5 is Obvious

5	The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to compress the data blocks containing video or image data for output at different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.
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Imai renders obvious Claim 1 (*see* §VII.A.1) and the additional limitation of Claim 5. Ex. 1003 at 159-162.

As discussed above, Imai teaches determining the data transmission rate of a communication channel to select a data compression encoder that outputs compressed data at a corresponding bit rate for the channel. *See* §VII.A.1, 1[d]–[e]. Imai recognizes that the transmission rate of the communication channel used

to transmit the coded data from server to client “varies due to the amount of traffic” being sent across the channel, and that this can impact the ability of the client to reproduce the transmitted signals in real time. Ex. 1005 at [0145]; Ex. 1003 at 159. Imai selects a “coding method which can provide the *coded data having a bit rate not higher than the detected transmission rate.*” Ex. 1005 at [0146], Abstract; Ex. 1003 at 159. But Imai also teaches that the throughput of the communications channel can fluctuate, and that the selection of Imai’s encoders changes “so as to include the encoding method which provides the coded data having a bit rate not larger than the transmission rate.” Ex. 1005 at [0154]. Therefore, in selecting a data compression encoder, Imai teaches the selection of one or more asymmetric data compression encoders according to the instantaneous bit rate of the communication channel at each time. See §VII.A.1, 1[d]–[e]; Ex. 1003 at 159.

Imai also teaches that the plurality of encoders may each use the same asymmetric compression algorithm, but each encoder is implemented differently to compress the data blocks for output at different data transmission rates:

In addition, here, it is here assumed that even in the case of the encoders all employing, e.g., ATRAC 2 only, if bit rates are different from each other, this means the use of “different coding methods”. Therefore, here, for example, all the encoders 53₁ to 53_N perform encoding

with ATRAC 2, while data rates of coded data outputted from the encoders are 64 Kbps, 32 Kbps, 24 Kbps, . . . , respectively.

Ex. 1005 at [0069]. Thus, Imai teaches a configuration in which a plurality of different encoders implement variations of ATRAC2 asymmetric compression to produce output data block streams at different transmission rates. Ex. 1003 at 160.

A POSITA would have appreciated from the ATRAC 2 example that it is advantageous to configure the one or more asymmetric data compression encoders to output compressed data blocks at different rates to support changing the bit rate of a stream when the throughput of the communications channel connecting the client and server changes. Ex. 1003 at 161.

Finally, Imai teaches that the selected one or more asymmetric data compression encoders produce a plurality of compressed data blocks. Ex. 1005 at [0070]–[0071] (explaining how each frame output from the frame cutting circuit 51 is supplied to an encoder for coding and then output with a separate header for each frame).

4. Dependent Claim 12 is Obvious

12	The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to perform compression in real-time or substantially real-time.
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Imai renders obvious Claim 1 (*see* §VII.A.1) and the additional limitation of Claim 12. Ex. 1003 at 163-164.

Imai teaches a “transmission system” designed to encode requested data in such a manner that “the client terminal 3 decodes the coded data and reproduces the original audio signals in *real time*, for example, (so-called streaming reproduction).” Ex. 1005 at [0051]. As discussed above, it would have been obvious to apply Imai’s teachings directed to real-time audio encoding to the video context because Imai explicitly taught this as well as considering the knowledge of a POSITA. Ex. 1003 at 163; *see* §VII.A.1, 1[a]. Specifically, Imai teaches that by detecting the transmission rate of the transmission line and selecting a compression algorithm “capable of providing the coded data having a bit rate corresponding to the detected transmission rate, . . . transmission of the coded data can be avoided from becoming too late” when “decoding and reproducing the coded data in real time.” Ex. 1005 at [0180]; *see id.* at [0094]–[0095]; [0100]; [0122]–[0123]; [0160]; [0180]; [0181]. A POSITA would have understood that compressing and transmitting data for real-time reproduction on a client would utilize real-time or substantially real-time compression so that data can be provided to the client in

real-time. Ex. 1003 at 164. A POSITA would also have known how to incorporate asymmetric video compression algorithms that operate in real-time because hardware and software implemented real-time asymmetric video encoders were readily available by 2001. Ex. 1003 at 164.

5. Dependent Claims 13 and 14 are Obvious

- | | |
|-----------|----------------------------------------------------------------------------------------------------|
| 13 | The system of claim 1, wherein the communications channel comprises: a distributed network. |
| 14 | The system of claim 13, wherein the distributed network comprises: the Internet. |

Imai renders obvious the limitations of Claim 1 (*see* §VII.A.1) and the additional limitations of Claims 13 and 14. Ex. 1003 at 165.

Imai explains that the communication channel, or network 2, is a network such as the Internet:

In this transmission system, when a request for time series digital signals, e.g., digital audio signals, is issued from a client terminal 3 to a server 1 ***via a network 2 such as Internet***, ISDN (Integrated Service Digital Network) or PSTN (Public Switched Telephone Network), the server 1 encodes the requested audio signals with a predetermined coding method, and resulting coded data is transmitted to the client terminal 3 via the network 2.

Ex. 1005 at [0051]. Because Imai teaches using the Internet, Claim 13 is also satisfied because Claim 14 states that the Internet is a form of distributed network.

Ex. 1003 at 165.

B. Ground 2: Claims 1, 3–6, and 9–14 are Obvious in View of Pauls

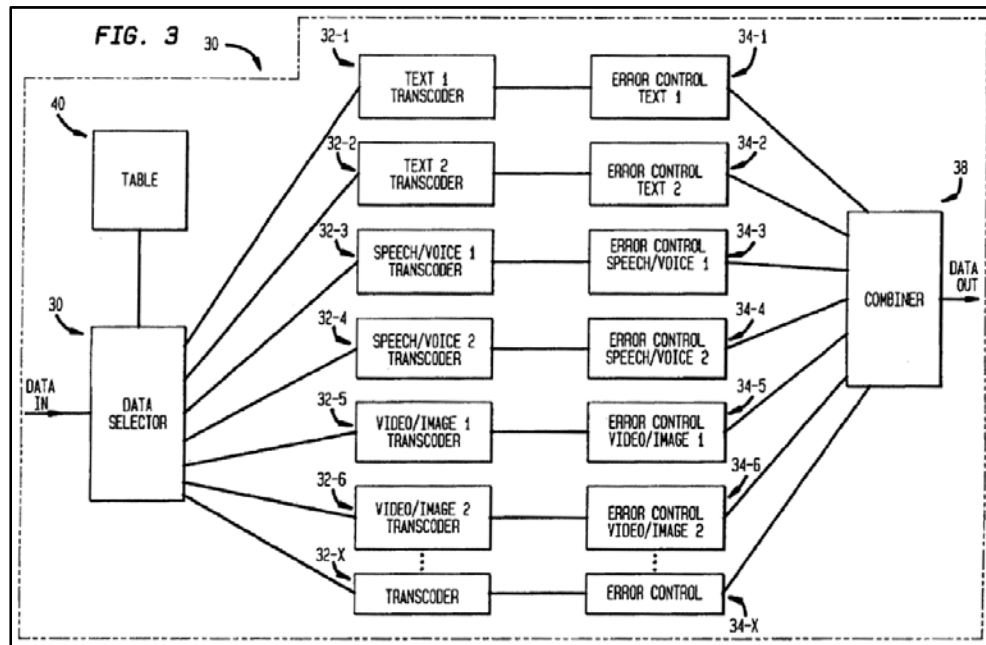
Pauls renders Claims 1, 3–6, and 9–14 obvious. To the extent that the Patent Owner argues that a single embodiment of Pauls does not teach all the limitations of the claims, a POSITA would have found the claims obvious, based on her own knowledge and Pauls’ other teachings. Ex. 1003 at 166.

1. Independent Claim 1 is Obvious

Pauls renders obvious Claim 1. Ex. 1003 at 167-185. To the extent the preamble (“[a] system”) is a limitation, it is met by Pauls’ teachings of an “access server” or “host.” Pauls teaches that the access server and the host are implemented in computers. Ex. 1007 at [0005]. The access server performs “adaptive communications formatting.” *See* Ex. 1007 at [0009]. Figure 3 depicts an embodiment of the access server, which “comprises a data selector 30, a plurality of text, speech/voice and video/image transcoding techniques 32–*n* (i.e., transcoding techniques for text, speech/voice and video/image data types) . . . and a combiner 38 for multiplexing formatted data.” Ex. 1007 at [0019]. Accordingly, Pauls teaches a system as set forth in Claim 1. Ex. 1003 at 167.

1[a] 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”

Pauls also teaches these limitations: “[t]he access server 20 comprises a data selector 30, *a plurality of text, speech/voice and video/image transcoding techniques 32–n* (i.e., transcoding techniques for text, speech/voice and video/image data types), a plurality of text, speech/voice and video/image error control schemes 34–n (i.e., error control schemes for text, speech/voice and video/image data types) and a combiner 38 for multiplexing formatted data.” Ex. 1007 at [0019] (emphasis added). The “access server” and the plurality of different transcoders 32–n are depicted in FIG. 3:



Pauls teaches that the transcoders implement “[t]ranscoding techniques [that] include encoding algorithms for encoding (or compressing) the data.” Ex. 1007 at [0010]. Pauls identifies several compression algorithms that may be used:

Algebraic Code Excited Linear Prediction (ACELP), Vector Sum Excited Linear Prediction (VSELP), Enhanced Variable Rate Coder (EVRC), *h.263 (which is a set of guidelines being considered by the International Telecommunications Union for implementation into standards)*, pkzip (by PKWare, Inc.), *MPEG and MPEG2 (Moving Pictures Experts Group)*, and JPEG (Joint Pictures Experts Group) are some examples of encoding algorithms which are well-known in the art.

Ex. 1007 at [0010].

Furthermore, several of Pauls’ data compression algorithms are asymmetric. As discussed in Section V.B.1, a POSITA would have understood the term “asymmetric data compression encoders” to mean “encoders configured to utilize a compression algorithm in which the execution time for the compression and decompression routines differ significantly.” A POSITA would have recognized that at least the H.263, MPEG, and MPEG-2 compression algorithms are asymmetric compression algorithms because motion compensation causes the compression routine of each to require substantially more execution time than the respective decompression routine. Ex. 1003 at 169-171. Because Pauls teaches a

plurality of different transcoders that can be configured to utilize different asymmetric compression algorithms, including H.263, MPEG, and MPEG2, Pauls teaches “a plurality of different *asymmetric data compression encoders*.” Ex. 1003 at 171-172.

<p>1[b] 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</p>

Pauls teaches this limitation. First, Pauls teaches compressing data blocks containing video or image data. Pauls teaches that the access server retrieves “a bit stream (or file)” from a host that is to be sent to the user. Ex. 1007 at [0008]. Pauls teaches that the bit stream or file may consist of several data types that include video and image data:

Data types include, but are not limited to, speech/voice, *video/image* and text. Each data type has one or more sub-types. Examples of speech/voice sub-types (and file extensions) include audio (.au), wave (.wav) and speech (.sp). *Examples of video/image sub-types include* tagged image format files (.tif), graphic image format files (.gif), Moving Picture Experts Group files (.mpg and .mp2).

Ex. 1007 at [0008]; Ex. 1003 at 173.

A POSITA would have understood that the bit stream or file containing video or image data meets the claim limitation of data blocks containing video or image data” because a bit stream or file is a “unit of data each comprising more than one bit,” and the bit stream or file represents video and image data. Ex. 1003 at 173.

Next, Pauls teaches using a first asymmetric data compression encoder and a second asymmetric data compression encoder where there the encoders compress video and image data at higher and lower data compression rates. The ’477 Patent uses the term “data compression rate” to refer to the execution or algorithmic speed of a compression encoder or, in other words, throughput as a measure of the amount of input data a compressor can compress and make available per unit of time at a given compression ratio. Ex. 1003 at 175.

H.263, MPEG, and MPEG2 are asymmetric data compression algorithms identified by Pauls. Ex. 1007 at [0010]; Ex. 1003 at 168-172. Pauls explains that “[e]ach of the aforementioned encoding algorithms have associated different levels or percentages of compression.” Ex. 1007 at [0010]. For example, FIG. 5 teaches that H.263 renders video at a bit rate of 8–24 Kbps, MPEG renders video at a bit rate of 1.5 Mbps, and MPEG2 renders video at a bit rate of 2.0 Mbps. Ex. 1007 at FIG. 5; Ex. 1003 at 176. A POSITA would have appreciated that each of these video compression algorithms have different relative rates of compression, with

MPEG having the lowest compression ratio and MPEG 2 and H.263 having relatively higher compression ratios. Ex. 1003 at 176; Ex. 1019 at 7–9 (comparing average compression ratios for MPEG, MPEG 2, and H.263). Moreover, a POSITA would have understood that it is only a remote possibility that any two different asymmetric data compression encoders would have the same execution speed, and therefore the obvious result of including two or more different asymmetric compression encoders is that one encoder would have a higher data compression rate than another encoder. Ex. 1003 at 176-178.

1[c] one or more processors configured to:

Pauls teaches this limitation because the access server performs “adaptive communications formatting” (Ex. 1007 at [0009]) and the access server is a computer (Ex. 1007 at [0005]). A POSITA would have understood that a “computer” contains one or more processors. Ex. 1003 at 179.

In addition, Figure 3 depicts an embodiment of the access server, which “comprises a data selector 30.” Ex. 1007 at [0019]. Pauls teaches that “[t]he data selector 30 is a device, such as a *microprocessor* with software, for selecting a transcoding technique 32–n and an error control scheme 34–n for formatting the data.” *Id.* at [0019]. Based upon Pauls’ teaching that the access server is a computer and that the data selector may be a microprocessor, a POSITA

would have known how to implement Claim 1 using one or more processors.

Ex. 1003 at 180.

- 1[d] 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**
- 1[e] 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.**

Pauls teaches that the transcoding techniques are selected based on determined parameters relating to the nature of the communications system such as the “throughput of a communications channel” (i.e., bit rate):

The particular transcoding techniques and error control schemes used to format the data should be adaptive to factors such as the *nature of the communications network 16 connecting the user 14 to the access server 20*, the preferences of the user 14, and the data type of the data, as will be discuss herein. Note that the present invention should not be limited to being adaptive to only the aforementioned factors. Other factors, such as interactivity, *bit rate and transmission delay*, may also be applicable.

Ex. 1007 at [0012] (emphasis added). Furthermore, Pauls claims a method where “*the transcoding technique* and error control scheme are *also selected based on nature of the communications network.*” *Id.* at Claim 5.

Pauls further explains that “[t]he nature of communications system depends on sub-factors such as . . . *the available bandwidth, the bit rate*, the signal-to-noise ratio, the bit error rate and the transmission delay. . . .” Ex. 1007 at [0013].

Pauls teaches that it is desirable to choose between compression algorithms to account for differences in throughput among communications technologies (such as wired versus wireless):

[T]he transmission times for data over wireless connections are typically greater than the transmission times for the same data over wired connections. The reasons for this are because wireless connections generally have less available bandwidth, lower bit rates and longer transmission delays than wired connections. *Therefore, it may be desirable to use a transcoding technique that will encode (or compress) the data as much as possible to reduce the transmission time over wireless connections* (and perhaps some wired connections).

Ex. 1007 at [0014].

Finally, a POSITA would have understood that a “bit rate” is conventionally measured in terms of bits per second. Ex. 1003 at 185.

2. Dependent Claims 3 and 4 are Obvious

3	The system of claim 1, wherein the throughput of the communications channel comprises: an estimated throughput of the communications channel.
4	The system of claim 1, wherein the throughput of the communications channel comprises: an expected throughput of the communications channel.

Pauls renders obvious Claim 1 (*see* §VII.B.1), and the additional limitations of Claims 3 and 4. Ex. 1003 at 186-189.

As explained for Claim 1, Pauls teaches looking to the nature of the communications network to determine the algorithm for selection. *See* §VII.B.1. As part of the discussion regarding the nature of the communication network, Pauls looks to whether the network is wired or wireless. Specifically, Pauls makes assumptions regarding the relative throughput of wired and wireless systems, explaining that wireless connections are not as good as wired connections mainly because of throughput: “[t]he reasons for this are because wireless connections generally have less available bandwidth, lower bit rates and longer transmission delays than wired connections.” Ex. 1007 at [0014]. This enables the host to improve transmission performance by tailoring the data compression format to the expected throughput of the communication line. *Id.*

Pauls' Claim 9 exemplifies this teaching by requiring selection of an algorithm based upon whether the network is wireless. Ex. 1007 at Claim 9 (reciting a method "characterized by the steps of: selecting a transcoding technique . . . to format the data based on whether the communications network includes a wireless communications system . . ."). It would have been obvious to a POSITA that Pauls' teaching regarding selecting an algorithm based upon whether a connection is wired or wireless is based upon either an estimated or expected throughput of the connection. Ex. 1003 at 186-188.

Moreover, a POSITA would have understood that the estimated and expected throughput would overlap in some instances. Ex. 1003 at 189. For example, the expected throughput would overlap with the estimated throughput when the system of Pauls estimates a wireless connection and expects the connection to continue to be wireless. Ex. 1003 at 189.

3. Dependent Claim 5 is Obvious

5	The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to compress the data blocks containing video or image data for output at different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.
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Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claim 5. Ex. 1003 at 190-191.

Pauls teaches that the selected one or more asymmetric data compression encoders compress video data blocks for output at different data transmission rates. H.263, MPEG, and MPEG2 are asymmetric data compression algorithms identified by Pauls. Ex. 1007 at [0010]. Pauls explains that “[e]ach of the aforementioned encoding algorithms have associated different levels or percentages of compression.” Ex. 1007 at [0010]. For example, FIG. 5 teaches that H.263 renders video at a bit rate in the range of 8–24 Kbps, MPEG renders video at a bit rate of 1.5 Mbps, and MPEG2 renders video at a bit rate of 2.0 Mbps. Ex. 1007 at FIG. 5; Ex. 1003 at 190. Thus, A POSITA would have appreciated that these video compression algorithms produce compressed data blocks containing video data at different transmission rates. Ex. 1003 at 190. Finally, a POSITA would have understood that “data transmission rates” are conventionally measured in terms of bits per second. Ex. 1003 at 191.

4. Dependent Claim 6 is Obvious

Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claim 6. Ex. 1003 at 192.

Pauls teaches the limitation of “wherein at least one of the plurality of different asymmetric data compression encoders is configured to utilize a standardized data compression algorithm capable of compressing video data.” As discussed above in SectionVII.B.1.1[a], Pauls expressly teaches transcoders being configured to utilize H.263, MPEG, and MPEG 2. *See* Ex. 1007 at [0011]. Because a POSITA would have understood that H.263, MPEG, and MPEG 2 are standardized compression algorithms capable of compressing video data, Pauls teaches this element. Ex. 1003 at 192.

5. Dependent Claim 9 is Obvious

9	The system of claim 1, wherein at least one of the determined one or more data parameters comprises: an attribute or a value related to a format or a syntax of video or image data contained in the data blocks containing video or image data.
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Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claim 9. Ex. 1003 at 193-195.

Pauls teaches that “[c]ertain transcoding techniques . . . are more effective when used to format particular data types. Thus, the transcoding techniques . . .

selected to format the data should be adaptive to the data type, as will be described herein.” Ex. 1007 at [0017].

Moreover, Pauls teaches detecting the data type using the file extension or other information contained in the bit stream: “[t]he data selector 30 can ***determine the data type using the file extension, other information contained within the bitstream***, default data types and/or a combination of the aforementioned.” Ex. 1007 at [0019]; *see also* [0008] (“The bitstream includes the data and control information. The data has associated a *filename with a file extension indicative of a data type* (and/or sub-type).”). A POSITA would have recognized that a file extension is a commonly use to indicate the format or syntax used by a file stored in a file system. Ex. 1003 at 195. Moreover, a POSITA would have appreciated that the files taught by Pauls meet the data block limitation because a file is a unit of data comprising more than one bit of information. Ex. 1003 at 195. Further, a POSITA would have understood that Pauls’ teaching regarding using “other information contained within the bitstream” to determine the data type would involve inspecting information in the bitstream related to a format or syntax of the file that those bits represent. Ex. 1003 at 195.

6. Dependent Claims 10 and 11 are Obvious

- | | |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 10 | The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to utilize a content-dependent data compression algorithm. |
| 11 | The system of claim 10, wherein the content-dependent data compression algorithm comprises: an arithmetic algorithm. |

Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claim 10. Ex. 1003 at 196-198.

Pauls teaches identifying the type of data to be compressed, and then selecting a suitable compression algorithm for that data type. Pauls explains that the effectiveness of compression techniques varies depending upon the data type:

Certain transcoding techniques and error control schemes are more effective when used to format particular data types. Thus, the transcoding techniques and error control schemes selected to format the data should be adaptive to the data type, as will be described herein. *Transcoding techniques include encoding algorithms for encoding or compressing particular data types:* gzip and pkzip for text data; VCELP, ASELP and EVRC for speech/voice data; and h.263 for video/image data.

Ex. 1007 at [0017].

In addition, Pauls includes a claim to a method including the steps of “determining a data type for the data [to be transmitted]; selecting a transcoding technique . . . to format the data based on the data type; [and] encoding the data using the selected transcoding technique” Ex. 1007 at Claim 5.

Thus, a POSITA would have understood that Pauls teaches providing multiple compression encoders that each use different compression algorithms that are particularly effective for different types of content (such as text, speech/voice data, and video data) so that a selection can be made between the encoders based upon the content of the data blocks to be compressed. Ex. 1003 at 198. Furthermore, because of the effectiveness of each algorithm depends upon the content of the data blocks to be compressed, a POSITA would have understood that the asymmetric data compression encoders taught by Pauls use content dependent compression algorithms. Ex. 1003 at 198.

Moreover, Claim 11 is rendered obvious because one of the foregoing content-dependent algorithms taught by Pauls is the H.263 data compression algorithm. Ex. 1003 at 199. A POSITA would have understood that H.263 has an arithmetic coding option, which uses an arithmetic algorithm for the entropy compression step. Ex. 1020 at 69–76 (describing Arithmetic Coding mode of H.263 standard); Ex. 1003 at 199.

7. Dependent Claim 12 is Obvious

12	The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to perform compression in real-time or substantially real-time.
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Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claim 12. Ex. 1003 at 200-202.

A POSITA would have found it obvious to configure the compression encoders to perform data compression in real-time or substantially real-time in view of Pauls. Pauls is directed to a system for transmitting data over communications networks such as the Internet. *See* Ex. 1007 at [0005]. Pauls teaches that users may desire obtaining the “output of *a real time* recording device, such as a video camera, microphone, . . . transducers or measuring devices.” Ex. 1007 at [0007]. Pauls teaches that its invention may be applied where interactivity is desired. Ex. 1007 at [0012]. Finally, Pauls teaches using the H.263 for video encoding. It was well-known in the art that H.263 is a video standard that was intended to support low bit-rate real-time video applications such as video conferencing. Ex. 1003 at 201-202; Ex. 1019 at 6. Indeed, Pauls refers to the fact that H.263 supports bit rates as low as 8–24 kbps. Ex. 1007 at FIG. 5.

Based upon the foregoing teachings, a POSITA would have found it obvious that compressing data in real-time or substantially real-time is desirable for providing satisfactory access to “real time recording devices” such as video

cameras, microphones, and measuring devices to support interactive applications such as video conferencing or remote telemetry. Ex. 1003 at 202. Accordingly, it would have been obvious to a POSITA to configure the compression encoders to achieve real-time or substantially real-time compression. Ex. 1003 at 202.

8. Dependent Claims 13 and 14 are Obvious

- | | |
|-----------|----------------------------------------------------------------------------------------------------|
| 13 | The system of claim 1, wherein the communications channel comprises: a distributed network. |
| 14 | The system of claim 13, wherein the distributed network comprises: the Internet. |

Pauls renders obvious Claim 1 (*see* §VII.B.1) and the additional limitations of Claims 13 and 14.

Pauls teaches “the communications network 16 comprises a plurality of wired and/or wireless communication systems for providing the user 14 with either a wired or a wireless connection to the access server 20.” Ex. 1007 at [0014]. Pauls FIG. 1 depicts an architecture for the system where the system “comprises a data network 12 (e.g., the Internet), a user 14, and a communications network 16.” Ex. 1007 at [0005]. Ex. 1003 at 203. A POSITA would have understood that the Internet is a distributed network. Ex. 1003 at 204.

Moreover, because Pauls teaches a configuration that utilizes the Internet as a communications channel, Claim 13 is also satisfied because Claim 14 states that the Internet is a form of distributed network. Ex. 1003 at 204.

C. Ground 3: Claims 1, 3–6, 9–14 are Obvious in View of Imai and Pauls

Although Imai explicitly states that its teachings are “also applicable to other signals such as video signals,” to the extent Patent Owner argues that Imai does not adequately teach video compression, such teachings are present in Pauls. Thus, the combination of Imai and Pauls renders obvious Claims 1, 3–6, 9–10, and 12–14.

1. Motivation to Combine Imai and Pauls

A POSITA would have many motivations to combine Imai and Pauls. Indeed, both references are used for the same purpose: encoding data at a server for transmission to a client over a distributed network such as the Internet. They both teach encoding the data using encoding methods that achieve data compression using asymmetric techniques. *See* §§VII.A.1, 1[a] and VII.B.1, 1[a]. Also, both references choose an encoding method based upon the type of data being transmitted. §§VII.A.1, 1[d]–[e], and VII.B.1, 1[d]–[e]. Further, both teach choosing the encoding method based upon a throughput of the communications channel connecting the client. §§VII.A.1, 1[d]–[e], and VII.B.1, 1[d]–[e]. Imai and Pauls discuss implementing their inventions on known computer systems. Ex. 1003 at 209; Ex. 1005 at [0052]–[0057]; Ex. 1007 at [0005].

While Imai discusses audio signals and data at length, Imai notes that its teachings are “also applicable to other signals such as video signals, other types of

time series signals, and signals being not in time series.” Ex. 1005 at [0172]. As Imai explicitly applies its teachings to video encoding, a POSITA would logically look towards other prior art references involving data encoding and video encoding techniques to create a video encoding and transmission system. One such prior art reference is Pauls, which includes extensive teachings specific to video. *See, e.g.*, Ex. 1007 at [0017–0019].

A POSITA would thus have been motivated to combine the systems of Imai and Pauls to utilize the numerous video and image data compression encoders of Pauls to enable video compression in Imai’s system. Ex. 1003 at 211-214. Additionally, a POSITA would be motivated to apply Imai’s detailed teachings regarding determining the bandwidth of a communication channel to Pauls’ system that selects from multiple video data compression encoders to fine-tune Pauls’ video transmission system. Ex. 1003 at 212. The combination of the teachings from Imai and Pauls would have predictable results when building a data encoding and transmitted system suitable for video data. Ex. 1003 at 212. In addition, a POSITA would have had a reasonable expectation of success in combining Imai and Pauls given the similarities in the systems, and given that audio and video compression technologies were well-known at the time. Ex. 1003 at 213.

2. Independent Claim 1 and Dependent Claims 6 and 9 are Obvious

As explained in Ground 1, Imai teaches all limitations of Claim 1. To the extent Patent Owner argues that Imai does not adequately teach compressing video or image data, Claim 1 is still obvious in view of the combination of Imai with Pauls, which has extensive teachings directed to video compression. For example, Imai teaches using well-known compression algorithms to encode data, and teaches using encoders that implement standardized audio compression algorithms such as ATRAC, ATRAC2, and MPEG layers 1, 2, and 3. Pauls teaches using encoders that implement standardized video algorithms such as MPEG, MPEG2 and H.263. A POSITA would have found it obvious to incorporate Pauls' video-specific compression encoders into Imai using her ordinary skill because a POSITA at the time of the alleged invention would have known how to make use of off-the-shelf implementations of standards-based video encoders and could use those encoders within Imai's multi-compressor system. Ex. 1003 at 215.

Claim 6 adds the requirement that at least one of the plurality of asymmetric data compression encoders uses "a standardized data compression algorithm capable of compressing video data," and Claim 9 adds the requirement of that the encoder selection be based upon "an attribute or value related to a format or system of a video or image data." These limitations are taught by Pauls (*see* §VII.B.4 and

§VII.B.5). Using the same rationale, a POSITA would have found it obvious to incorporate Pauls' video-specific teachings into a combination of Imai and Pauls. Ex. 1003 at 216.

3. Dependent Claims 3 and 4 are Obvious

3	The system of claim 1, wherein the throughput of the communications channel comprises: an estimated throughput of the communications channel.
4	The system of claim 1, wherein the throughput of the communications channel comprises: an expected throughput of the communications channel.

As explained in Ground 1, Imai teaches selecting from a plurality of asymmetric data compression encoders based upon “an estimated throughput of the communications channel” or “an expected throughput of the communications channel.” *See* §VII.A.2. Similarly, Pauls teaches selecting transcoding techniques based on determined parameters relating to the nature of the communications system such as the “throughput of a communications channel.” *See* §VII.B.1.

In implementing the combined system of Imai and Pauls, a POSITA would have been motivated to use Imai's and/or Pauls' teachings to select an appropriate asymmetric data compression encoder based upon network throughput and applying this technique would be obvious and within the level of skill in the art, as shown by Imai and Pauls. Ex. 1003 at 218.

4. Dependent Claim 5 is Obvious

5 The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to compress the data blocks containing video or image data for output at different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.

As explained in Ground 1, Imai teaches all limitations of Claim 5. To the extent Patent Owner argues that Imai does not adequately teach compressing video or image data, Claim 5 is obvious in view of the combination of Imai with Pauls, which has extensive teachings directed to video compression. *See* §VII.B.1.

In addition, Pauls teaches all limitations of Claim 5. To the extent that Patent Owner argues that Pauls' asymmetric data compression encoders are not configured to compress video image data at different data transmission rates, it would have been obvious for a POSITA to combine Pauls with Imai's teaching of multiple asymmetric data compression encoders that are each configured to output data at different rates. Ex. 1003 at 220. For example, Imai teaches using separate encoders that each "perform encoding with ATRAC 2, while data rates of coded data outputted from the encoders are 64 Kbps, 32 Kbps, 24 Kbps, . . . , respectively." Ex. 1005 at [0069]. The same technique could be applied to video by selecting an appropriate encoder in view of the target data rate. Ex. 1003 at 220.

5. Dependent Claim 6 is Obvious

A POSITA would have found it obvious to include Pauls' teaching that "at least one of the plurality of different asymmetric data compression encoders is configured to utilize a standardized data compression algorithm capable of compressing video data" in a combination of Imai and Pauls. *See* §VII.B.4; Ex. 1003 at 221. Both Imai and Pauls teach using well-known compression algorithms, and a POSITA would have wanted to save time and development effort by reusing a well-known and standardized compression algorithm for video, such as the ones taught by Pauls. Ex. 1003 at 221. Furthermore, the '477 Patent identifies no reason that a POSITA could not have substituted well-known compression algorithms for any other well-known compression algorithms. Ex. 1003 at 222.

6. Dependent Claim 9 is Obvious

A POSITA would have found it obvious to include Pauls' teaching of "wherein at least one of the determined one or more data parameters comprises: an attribute or a value related to a format or a syntax of video or image data contained in the data blocks containing video or image data" in the combination of Imai and Pauls. *See* §VII.B.5; Ex. 1003 at 223. A POSITA would have found it logical to use the format or syntax of the video or image data to select a compression encoder because there are a number of potential compression encoders that may be used in

a combination of Imai and Pauls (e.g., encoders that are particularly suited for voice, text, and video), and including this capability will permit discriminating between data types and choosing a suitable compression encoder for video or image data blocks. Ex. 1003 at 223.

7. Dependent Claims 10 and 11 are Obvious

As explained in Ground 2 for Claims 10 and 11, Pauls teaches the use of a content-dependent compression algorithm, as well as a content-dependent compression algorithm that comprises an arithmetic algorithm (e.g., H.263). *See* §VII.B.6. As explained in the motivation to combine section, a POSITA would have found it obvious to include the Pauls' content-dependent compression algorithm (H.263) in a combination of Imai and Pauls. Ex. 1003 at 224.

8. Dependent Claim 12 is Obvious

Claim 12 adds the requirement that the asymmetric data compression encoders be configured to perform in “real-time or substantially real-time.” Imai expressly teaches real-time reproduction of audio signals. *See* §VII.A.4. Moreover, it would have been obvious to include real-time compression to Pauls given its teaching of encoding data from real-time data sources such as video cameras and measuring devices and providing interactivity. *See* §VII.B.7. Therefore, it would have been obvious to a POSITA to include encoders

configured to perform in “real-time or substantially real-time” in a combination of Imai and Pauls. Ex. 1003 at 225.

9. Dependent Claims 13 and 14 are Obvious

Imai and Pauls each teach where the communications network is “a distributed network” and “the Internet.” *See* §VII.B.8 and §VII.C.9. Therefore, a POSITA would have found it obvious to use a “distributed network” and “the Internet” as the communications network in a combination of Imai and Pauls. Ex. 1003 at 226.

D. Ground 4: Claims 2, 11, 20–22, and 25–27 of the ’477 Patent Are Rendered Obvious by Imai in view of Pauls and Chao

1. Arithmetic Coding

Claims 2, 11, 20–22, and 25–27 all require at least one asymmetric encoder that uses an arithmetic algorithm. Pauls teaches using asymmetric video compression algorithms including H.263 and JPEG, which both have optional arithmetic algorithm modes. To the extent Patent Owner argues that the claims are not obvious because in view of H.263 or JPEG, Petitioners submit it would have been obvious to combine the teachings of Chao with Imai and Pauls. Chao teaches an asymmetric video compression algorithm that uses an arithmetic algorithm. Ex. 1003 at 227; Ex. 1016 at 7:5–8.

Arithmetic data compression encoders were well-known in the prior art years before the filing of the ’477 Patent. Ex. 1003 at 228; Ex. 1018 at 14–15

(book devoting a 26–page chapter to arithmetic coding and stating that arithmetic coding has “replac[ed] Huffman coding” as the “best fixed-length coding method available” in the “last ten years” before its 1991 publication). The ’477 Patent admits that arithmetic compression was not only known in the prior art, but that it was a “popular compression technique” and that it “possesses the highest degree of algorithmic effectiveness.” Ex. 1001 at 5:11–12. A POSITA would have known of arithmetic data compression encoders, understood the benefits of such an effective technique, and known that such encoders could be used to complement or as a substitute to other well-known asymmetric encoders used in Imai and Pauls. Ex. 1003 at 228.

Pauls teaches using arithmetic compression algorithms, including H.263 and JPEG which both utilize an arithmetic algorithm in their respective arithmetic coding modes. Ex. 1007 at [0010]; Ex. 1020 at 69–76 (describing Arithmetic Coding mode of H.263 standard); Ex. 1008 at 32 (“JPEG uses two techniques for entropy coding: Huffman coding and arithmetic coding.”), 49. Annex E of the 1998 H.263 standard discloses a Syntax-based Arithmetic Coding mode that uses an arithmetic algorithm to code data. Ex. 1020 at 69–76, Ex. 1003 at 229. JPEG also has an arithmetic coding mode that uses an arithmetic algorithm to code data. Ex. 1008 at 32–34 (“JPEG uses two techniques for entropy coding: Huffman

coding and arithmetic coding.”), 49 (describing lossless entropy-coding by arithmetic coding).

2. Independent Claim 20 and Dependent Claim 2

Claim 20 and Claim 2 include all limitations of independent Claim 1 and have the additional requirement that “at least one of the plurality of different asymmetric data compression encoders is configured to utilize an arithmetic algorithm.” Imai alone or in view of Pauls teaches and renders obvious Claim 1. *See* §VII.A.1, §VII.C.2.

Imai teaches selecting from a plurality of well-known, asymmetric data encoders. Imai teaches that encoders 53₁ to 53_N employ “different coding methods from each other” and are thus different encoders. Ex. 1005 at [0067]; Ex. 1003 at 231. Imai teaches that the encoders may use well-known asymmetric coding algorithms such as ATRAC 2 and MPEG layer 3. *See* §VII.A.1.

Pauls also teaches selecting from a plurality of well-known, asymmetric data encoders that are suitable for video such as H.263, MPEG, and MPEG 2. *See* §VII.B.1. At the very least, Pauls teaches asymmetric data encoders that have optional arithmetic coding modes, such as H.263. *See* §VII.D.1.

Despite arithmetic encoders being admitted prior art, being generally known in the art, and being disclosed by Pauls’ video and image encoders, Petitioners use Chao as one specific exemplar of an arithmetic video encoder that could be

combined with Imai and Pauls. Chao teaches an asymmetric video data compression encoder that uses an arithmetic algorithm. Ex. 1016 at 7:5–8, 14:16–18. Chao’s compression encoder is “wavelet-based” in that it performs a wavelet transform on input digital data and discards transform coefficients falling below a threshold. Ex. 1016 at 6:35–7:4. The resultant video data is further compressed using a “arithmetic, run length, or Huffman encoding” technique. Ex. 1016 at 7:5–8. Chao teaches that the algorithm is “selected at run-time by the user, based on the desired compression ratio and the amount of time required to get the selected level of compression.” Ex. 1016 at 14:19–25. Moreover, Chao’s compression encoder is asymmetric because the transform and coefficient pruning processes only occur on the compression-side and is not implemented by the decoder, and therefore the decoder implementation is less complex. Ex. 1003 at 233; *see* Ex. 1016 at 6:35–7:4; 15:9–15.

A POSITA would have been motivated to combine Chao’s arithmetic video data compression encoder with the systems of Imai and Pauls for several reasons. First, Chao states that “an advantage of the present invention [is] to provide a system and method of a wavelet-based image compression that is suitable for both still and video images.” Ex. 1016 at 6:27–30. Chao teaches that its approach can improve upon the compression ratio and speed of existing H.263 and MPEG encoders (Ex. 1016 at 5:3–11), which are the same standards used in Pauls.

Second, it would have been obvious to substitute Chao's video encoder for Pauls' H.263 video encoder because it would be a simple substitution of one encoder for another to obtain the benefits from using an arithmetic coder. Ex. 1018 at 14–15 (book stating that arithmetic coding has “replac[ed] Huffman coding” as the “best fixed-length coding method available” in the “last ten years” before its 1991 publication); Ex. 1003 at 235. The substitution is also reasonable because Pauls' H.263 is an asymmetric video encoder that has an optional arithmetic coding mode. Ex. 1003 at 235.

3. Dependent Claims 10 and 11

This petition previously explained how Pauls' H.263 data compression algorithm renders obvious Claims 10 and 11 in Ground 2 (Pauls) (*see* §§VII.B.6), as well in Ground 3 (Imai and Pauls) (*see* §VII.C.7). To the extent that Patent Owner argues that Pauls' H.263 teaching does not render obvious the limitations of claims 10 and 11, these claims are rendered obvious by Chao's arithmetic coding algorithm. Ex. 1003 at 236. First, a POSITA would have understood that Chao's video or image compression algorithm is a content-dependent algorithm for at least the reason that it teaches using a lossy compression step. Ex. 1003 at 236. Chao teaches applying a wavelet-transformation to the color space of an image or video to be compressed. *See, e.g.* Ex. 1016 at 6:16–7:14. Also, Chao explains that its first embodiment is lossy because the wavelet-transformation uses “[b]oth

thresholding and quantization [that] reduce accuracy with which the wavelet coefficients are represented.” Ex. 1016 at 13:5–7. An algorithm that uses a lossy compression step is content-dependent because not all forms of content can tolerate data loss during a compression/decompression cycle and remain usable. Ex. 1003 at 236. One example of such content is a binary executable file. Ex. 1003 at 236.

Second, a POSITA would have recognized that Chao teaches an arithmetic coding algorithm. Ex. 1003 at 237. Chao teaches that after performing the wavelet transformation, an entropy compression algorithm such as “arithmetic, run length, or Huffman coding, or a combination of Huffman and run length encoding” is applied. Ex. 1016 at 7:5–8; Ex. 1003 at 237.

Thus, the combination of Chao, Imai, and Pauls renders Claims 10 and 11 obvious when Chao’s compression algorithm that uses a lossy step with an arithmetic coding step is used. Ex. 1003 at 238.

4. Dependent Claims 21–22 and 25–27 are Obvious

Claims 21–22 and 25–27 depend from independent Claim 20, and are analogous to Claims 3–5, 9, and 12–14 that depend from independent Claim 1. The material difference between these sets of claims is that Claim 20 and its dependents require at least one arithmetic data compression encoder. However, the additional limitations of these dependent claims do not implicate the implementation of an arithmetic encoder as taught by Imai, Pauls, and Chao and

thus are rendered obvious by the teachings of Imai and Pauls for the same reasons as the analogous claim limitations set forth below:

Dependent Claim	Analogous Claim
21. The system of claim 20, wherein the throughput of the communications channel comprises: an estimated or expected throughput of the communications channel.	Claim 3, 4
22. The system of claim 20, wherein the selected one or more video data compression encoders are configured to compress one or more data blocks containing video data for different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.	Claim 5
25. The system of claim 20, wherein at least one of the determined one or more data parameters comprises: an attribute or a value related to a format or a syntax of video data contained in one or more data blocks containing video data.	Claim 9
26. The system of claim 20, wherein the selected one or more video data compression encoders are configured to perform data compression in real-time or substantially real-time.	Claim 12
27. The system of claim 20, wherein the communications channel comprises: a distributed network or the Internet.	Claim 13, 14

With respect to Claim 21, the relevant claim elements, except for the use of an arithmetic coder such as that taught in Chao, have already been addressed

previously. *See* §VII.C.3. To the extent Patent Owner argues that Pauls' H.263 encoder with an optional arithmetic mode does not render the claim obvious, the substitution of Pauls' H.263 encoder with Chao would be a straight-forward replacement of a component of the overall system that does not implicate the choice of communications channel. Ex. 1003 at 240.

For each of Claims 22, 25, and 26, the addition of a video compression encoder that uses an arithmetic compression algorithm to the plurality of asymmetric video compression encoders does not impact the analysis of parallel Claims 5, 9, and 12 because Claims 22, 25, and 26 do not require that the video compression encoder that uses an arithmetic compression algorithm be the selected compression algorithm. *See* §VII.C.4; §VII.C.6; §VII.C.8; Ex. 1003 at 241.

Lastly, for Claim 27, the addition of an arithmetic coder to the combined teachings of Imai and Paul would not implicate the choice of the communications channel being a distributed network or the Internet. *See* §VII.C.9; Ex. 1003 at 242.

VIII. CONCLUSION

Based on the foregoing, Petitioners respectfully request institution of *inter partes* review and the cancelation of Claims 1–6, 9–14, 20–22, and 25–27 of the '477 Patent as unpatentable.

IX. MANDATORY NOTICES AND FEES

Real Party In Interest: The real parties in interest are Amazon.com, Inc., Amazon Digital Services LLC, Amazon.com Services, Inc.⁵ Hulu, LLC, and Netflix, Inc. and Netflix Streaming Services, Inc. With respect to Hulu, LLC, while it is the real party-in-interest, the following entities own ten percent or more of the stock of Hulu: The Walt Disney Company, 21st Century Fox, Comcast Corporation and Time Warner Inc. None of the parties listed above as part-owners of Hulu controlled or funded this *Inter Partes* Review proceeding (IPR), nor did they contribute to the preparation of this IPR in any way.

Related Matters: The '477 Patent is the subject of the following civil actions:

- *Realtime Adaptive Streaming LLC v. Amazon.com, Inc. et al*,
Case No. 6-17-cv-00549, Eastern District of Texas
- *Realtime Adaptive Streaming LLC v. Hulu, LLC*,
Case No. 2-17-cv-07611, Central District of California
- *Realtime Adaptive Streaming LLC v. Cisco Systems, Inc.*,
Case No. 6-17-cv-00591, Eastern District of Texas
- *Realtime Adaptive Streaming LLC v. Brightcove Inc. et al*,
Case No. 1-17-cv-01519, District of Delaware

⁵ “Amazon Digital Services, Inc.” does not exist but was originally listed by Realtime in its Complaint in Civil Action No. 6:17-cv-00549 (E.D. Tex.) before being subsequently dismissed.

- *Realtime Adaptive Streaming LLC v. Haivision Network Video Inc.*,
Case No. 1-17-cv-01520, District of Delaware
- *Realtime Adaptive Streaming LLC v. Polycom, Inc.*,
Case No. 1-17-cv-02692, District of Colorado
- *Realtime Adaptive Streaming LLC v. Netflix, Inc. et al*,
Case No. 1-17-cv-01692, District of Delaware
- *Realtime Adaptive Streaming LLC v. Sony Electronics Inc.*,
Case No. 1-17-cv-01693, District of Delaware
- *Realtime Adaptive Streaming LLC v. Apple Inc.*,
Case No. 1-17-cv-02869, District of Colorado
- *Realtime Adaptive Streaming LLC v. Adobe Systems Incorporated*,
Case No. 1-18-cv-10355, District of Massachusetts
- *Realtime Adaptive Streaming LLC v. Samsung Electronics Co., Ltd. et al*, Case No. 6-18-cv-00113, Eastern District of Texas
- *Realtime Adaptive Streaming LLC v. Wowza Media Systems LLC*,
Case No. 1-18-cv-00927, District of Colorado
- *Realtime Adaptive Streaming LLC v. Google LLC et al*,
Case No. 2-18-cv-03629, Central District of California
- *Realtime Adaptive Streaming LLC v. Avaya Inc.*,
Case No. 1-18-cv-01046, District of Colorado
- *Realtime Adaptive Streaming LLC v. Broadcom Corporation et al.*,
Case No. 1-18-cv-01048, District of Colorado
- *Realtime Adaptive Streaming LLC v. LG Electronics Inc. et al*,
Case No. 6-18-cv-00215, Eastern District of Texas

- *Realtime Adaptive Streaming LLC v. Advanced Micro Devices, Inc.*,
Case No. 1-18-cv-01173, District of Colorado
- *Realtime Adaptive Streaming LLC v. Intel Corporation*,
Case No. 1-18-cv-01175, District of Colorado
- *Realtime Adaptive Streaming LLC v. Mitel Networks, Inc.*,
Case No. 1-18-cv-01177, District of Colorado
- *Realtime Adaptive Streaming LLC v. Cox Communications, Inc.*,
Case No. 8-18-cv-00942, Central District of California
- *Realtime Adaptive Streaming LLC v. Charter Communications, Inc. et al.*, Case No. 1-18-cv-01345, District of Colorado

The '477 Patent has not yet been the subject of a petition for *inter partes* review.

Lead and Backup Counsel: Pursuant to 37 C.F.R. §42.8(b)(3) and 42.10(a), Petitioners designate Harper Batts (Reg. No. 56,160) as lead counsel and Eliot Williams (Reg. No. 50,822) and Jennifer Nall (Reg. 57,053) as back-up counsel, each of Baker Botts L.L.P.

Service Information: Service information is as follows: Baker Botts L.L.P., 1001 Page Mill Road, Building One, Suite 200, Palo Alto, CA, 94304; Tel. (650) 739-7500; Fax (650) 739-7609. Petitioners consent to electronic service by email at harper.batts@bakerbotts.com, eliot.williams@bakerbotts.com, jennifer.nall@bakerbotts.com, and dl-realtime-ipr-service@bakerbotts.com

Fees: The Office is authorized to charge fees for this Petition to Deposit
Account No. 02-0384, Ref. 086026.0105.

Respectfully submitted,

BAKER BOTTS L.L.P.

/Harper Batts/
Harper Batts (Reg. No. 56,160)
Attorney for Petitioners

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1001 Page Mill Road, Bldg. One, Suite 200
Palo Alto, CA 94304
(650) 739-7500

CLAIM APPENDIX

1. 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.

2. The system of claim 1, wherein at least one of the plurality of different asymmetric data compression encoders is configured to utilize an arithmetic algorithm.

3. The system of claim 1, wherein the throughput of the communications channel comprises:

an estimated throughput of the communications channel.

4. The system of claim 1, wherein the throughput of the communications channel comprises:

an expected throughput of the communications channel.

5. The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to compress the data blocks containing video or image data for output at different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.

6. The system of claim 1, wherein at least one of the plurality of different asymmetric data compression encoders is configured to utilize a standardized data compression algorithm capable of compressing video data.

7. The system of claim 1, wherein at least one of the determined one or more data parameters comprises:

a resolution of the data blocks containing video or image data.

8. The system of claim 1, wherein at least one of the determined one or more data parameters comprises:

a data transmission rate of the data blocks containing video or image data.

9. The system of claim 1, wherein at least one of the determined one or more data parameters comprises:

an attribute or a value related to a format or a syntax of video or image data contained in the data blocks containing video or image data.

10. The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to utilize a content-dependent data compression algorithm.

11. The system of claim 10, wherein the content-dependent data compression algorithm comprises:

an arithmetic algorithm.

12. The system of claim 1, wherein the selected one or more asymmetric data compression encoders are configured to perform compression in real-time or substantially real-time.

13. The system of claim 1, wherein the communications channel comprises:

a distributed network.

14. The system of claim 13, wherein the distributed network comprises:

the Internet.

15. The system of claim 1, wherein the selected one or more asymmetric data compression encoders are utilized to compress the data blocks containing video or image data to create one or more compressed data blocks, and

wherein a descriptor is associated with the one or more compressed data blocks that indicates the selected one or more asymmetric data compression encoders.

16. The system of claim 1, wherein the selected one or more asymmetric data compression encoders are utilized to compress the data blocks containing video or image data to create one or more compressed data blocks, and wherein a descriptor indicating the selected one or more asymmetric data compression encoders is included with the one or more compressed data blocks.

17. The system of claim 1, wherein at least one of the determined one or more data parameters comprises:

a video or image data profile.

18. The system of claim 1, wherein the one or more processors are further configured to encode each of the data blocks containing video or image data with a plurality of the selected one or more asymmetric data compression encoders to create compressed data blocks.

19. The system of claim 18, further comprising:
a memory for storing the compressed data blocks.

20. A system, comprising:
a plurality of video data compression encoders;
wherein at least one of the plurality of video data

compression encoders is configured to utilize an asymmetric data compression algorithm, and wherein at least one of the plurality of video data compression encoders is configured to utilize an arithmetic data compression algorithm, wherein a first video data compression encoder of the plurality of video data compression encoders is configured to compress at a higher compression ratio than a second data compression encoder of the plurality of 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; and
- select one or more video data compression encoders from among the plurality of video data compression encoders based upon, at least in part, the determined one or more data parameters.

21. The system of claim 20, wherein the throughput of the communications channel comprises:

an estimated or expected throughput of the communications
channel.

22. The system of claim 20, wherein the selected one or more video data compression encoders are configured to compress one or more data blocks containing video data for different data transmission rates measured in bits per second to produce a plurality of compressed data blocks.

23. The system of claim 20, wherein at least one of the determined one or more data parameters are related to a resolution of one or more data blocks containing video data.

24. The system of claim 20, wherein at least one of the determined one or more data parameters comprises:

a data transmission rate of one or more data blocks
containing video data.

25. The system of claim 20, wherein at least one of the determined one or more data parameters comprises:

an attribute or a value related to a format or a syntax of
video data contained in one or more data blocks containing
video data.

26. The system of claim 20, wherein the selected one or more video data compression encoders are configured to perform data compression in real-time or substantially real-time.

27. The system of claim 20, wherein the communications channel comprises:

a distributed network or the Internet.

28. The system of claim 20, wherein the one or more data blocks containing video data are compressed with the selected one or more video data compression encoders to create one or more compressed data blocks, and

wherein a descriptor is associated with the one or more compressed data blocks that indicates the selected one or more video data compression encoders.

29. The system of claim 20, wherein the one or more processors are configured to encode each of one or more data blocks with a plurality of the selected one or more asymmetric data compression encoders to create compressed data blocks.

CERTIFICATE OF SERVICE

The undersigned hereby certifies that on June 4, 2018, true and correct copies of the foregoing Petition for *Inter Partes* Review of U.S. Patent No. 9,769,477 and Exhibits 1001-1024 were served in their entirety on the following parties via FedEx Express® or Express Mail:

Litigation Counsel:

Marc A. Fenster
Russ August & Kabat
12424 Wilshire Blvd. 12th Floor
Los Angeles, CA 90025

Correspondence Address:

Shami Messinger PLLC
1000 Wisconsin Ave. NW
Suite 200
Washington, DC 20007

BAKER BOTTS L.L.P.

/Harper Batts/
Harper Batts (Reg. No. 56,160)
Attorney for Petitioners

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**CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME
LIMITATION, TYPEFACE REQUIREMENTS, AND TYPE STYLE
REQUIREMENTS**

1. This Petition complies with the type-volume limitation of 14,000 words, comprising 13,973 words, excluding the parts exempted by 37 C.F.R. § 42.24(a).

2. This Petition complies with the general format requirements of 37 C.F.R. § 42.6(a) and has been prepared using Microsoft® Word 2016 in 14-point Times New Roman.

Respectfully submitted,

BAKER BOTTS L.L.P.

/Harper Batts/
Harper Batts (Reg. No. 56,160)
Attorney for Petitioners

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