

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

DISNEY ENTERTAINMENT & SPORTS LLC,
Petitioner

v.

ADEIA GUIDES INC.,
Patent Owner.

Case No. IPR2026-00052
U.S. Patent No. 8,542,705

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 8,542,705**

TABLE OF CONTENTS

	Page
I. INTRODUCTION	1
II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8.....	1
III. FEE AUTHORIZATION	3
IV. GROUNDS FOR STANDING.....	3
V. PRECISE RELIEF REQUESTED	3
VI. THE CHALLENGED PATENT	3
VII. PROSECUTION HISTORY OF THE '705 PATENT.....	7
VIII. LEVEL OF ORDINARY SKILL IN THE ART	9
IX. PRIORITY DATE	9
X. CLAIM CONSTRUCTION	9
A. “media aggregation server” (Claims 1, 2, 5-7)	9
B. “key frame” (Claims 1, 2, 5-7).....	10
C. “group of pictures (GOP)” (Claims 1, 5)	10
D. “predictive frame” (Claim 1).....	10
E. “wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis” (Claim 1).....	11
F. “wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel change request” (Claim 1).....	11
G. “identifying a next available key frame associated with the second media stream” (Claim 1)	12
H. Order of steps (Claim 1).....	12
I. “wherein the first media stream is a first video stream and the second media stream is a second video stream” (Claim 2).....	12
XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART	13
A. Mao (Ex-1005)	13
B. Liu (Ex-1006).....	16

TABLE OF CONTENTS

(continued)

	Page
C. Sherer (Ex-1007)	18
D. Wu-771 (Ex-1008)	20
XII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS	22
A. Grounds 1/2: Claims 1, 2, 4-9, 11-16, and 18-20 are obvious over Mao or Mao further in view of Liu.	22
1. A POSITA would have been motivated to combine Mao's and Liu's teachings and would have had a reasonable expectation of success.....	22
2. Independent Claims 1 and 15.....	27
a. Element 1[pre]: A method:	27
Element 15[pre]: A non-transitory computer readable medium, comprising:	27
b. Elements 1[A]/15[A]: [(i)] [receiving]/[computer code for receiving] a first media stream including a first plurality of frames, [(ii)] the first media stream received at a streaming server and maintained in a first buffer, the streaming server configured to receive the first media stream from a media aggregation server, [(iii)] wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;.....	28
c. Elements 1[B]/15[B]: [receiving]/[computer code for receiving] a second media stream including a second plurality of frames, the second media stream received at the streaming server and maintained in a second buffer;.....	34

TABLE OF CONTENTS

(continued)

	Page
d. Elements 1[C]/15[C]: [(i)] [determining]/[computer code for determining] positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, [(ii)] wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames;	36
e. Elements 1[D]/15[D]: [receiving]/[computer code for receiving] a channel change request from a client device receiving the first media stream, the channel change request corresponding to a switch from the first media stream to the second media stream;	39
f. Elements 1[E]/15[E]: [identifying]/[computer code for identifying] a next available key frame associated with the second media stream, wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel.....	42
3. Dependent Claims 2, 4-7, 16, and 18-20	47
a. Claims 2/16: [The method of claim 1]/[The computer readable medium of claim 15], wherein the first media stream is a first video stream and the second media stream is a second video stream.	47
b. Claims 4/18: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by detecting the start of a GOP.	48

TABLE OF CONTENTS

(continued)

	Page
c. Claims 5/19: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by flagging each start of a GOP as a key frame.....	48
d. Claims 6/20: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frame is an I-frame.....	49
e. Claim 7: The method of claim 1, wherein channel change does not occur until the second key frame can be provided to the client device.	49
4. Independent Claim 8	50
a. Element 8[pre]: A system:.....	50
b. Element 8[A]: [(i)] an interface configured to receive a first media stream including a first plurality of frames, [(ii)] a second media stream including a second plurality of frames, [(iii)] the first media stream received at a streaming server and maintained in a first buffer and [(iv)] and the second media stream received at the streaming server and maintained in a second buffer, [(v)] the streaming server configured to receive the first media stream from a media aggregation server, wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;.....	51

TABLE OF CONTENTS

(continued)

Page

c.	Element 8[B]: a processor configured to determine positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames;.....	52
d.	Element 8[C]: wherein the processor is further configured to identify a next available key frame associated with the second media stream, wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel change request.....	52
5.	Dependent Claims 9 and 11-14.....	53
a.	Claim 9: The method of claim 8, wherein the first media stream is a first video stream and the second media stream is a second video stream.....	53
b.	Claim 11: The method of claim 8, wherein the key frames are identified by detecting the start of a GOP.	53
c.	Claim 12: The method of claim 8, wherein the key frames are identified by flagging each start of a GOP as a key frame.	53
d.	Claim 13: The method of claim 9, wherein the key frame is an I-frame.....	53
e.	Claims 14: The method of claim 8, wherein channel change does not occur until the second key frame can be provided to the client device.....	54

TABLE OF CONTENTS

(continued)

	Page
B. Ground 3: Claims 1, 2, 4-6, 8, 9, 11-13, 15, and 18-20 are obvious in view of Sherer in view of Wu-771.....	54
1. A POSITA would have been motivated to combine Sherer's teachings and Wu-771's teachings and would have had a reasonable expectation of success.	54
2. Independent Claims 1 and 15.....	57
a. Element 1[pre]: A method:	57
Element 15[pre]: A non-transitory computer readable medium, comprising:	57
b. Elements 1[A]/15[A]: [(i)] [receiving]/[computer code for receiving] a first media stream including a first plurality of frames, [(ii)] the first media stream received at a streaming server and maintained in a first buffer, the streaming server configured to receive the first media stream from a media aggregation server, [(iii)] wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;.....	58
c. Elements 1[B]/15[B]: [receiving]/[computer code for receiving] a second media stream including a second plurality of frames, the second media stream received at the streaming server and maintained in a second buffer;.....	63
d. Elements 1[C]/15[C]: [(i)] [determining]/[computer code for determining] positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, [(ii)] wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames;	65

TABLE OF CONTENTS

(continued)

	Page
<ul style="list-style-type: none"> e. Elements 1[D]/15[D]: [receiving]/[computer code for receiving] a channel change request from a client device receiving the first media stream, the channel change request corresponding to a switch from the first media stream to the second media stream;..... f. Elements 1[E]/15[E]: [identifying]/[computer code for identifying] a next available key frame associated with the second media stream, wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel..... 	68 70
3. Dependent Claims 2, 4-6, 16, and 18-20	75
<ul style="list-style-type: none"> a. Claims 2/16: [The method of claim 1]/[The computer readable medium of claim 15], wherein the first media stream is a first video stream and the second media stream is a second video stream. b. Claims 4/18: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by detecting the start of a GOP. c. Claims 5/19: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by flagging each start of a GOP as a key frame. d. Claims 6/20: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frame is an I-frame..... 	75 76 77 77
4. Independent Claim 8	78
<ul style="list-style-type: none"> a. Element 8[pre] b. Element 8[A] c. Element 8[B]..... 	78 78 79

TABLE OF CONTENTS
(continued)

	Page
d. Element 8[C].....	80
5. Dependent Claims 9 and 11-13.....	80
a. Claim 9.....	80
b. Claim 11.....	80
c. Claim 12.....	80
d. Claim 13.....	81
XIII. CONCLUSION.....	81

LIST OF EXHIBITS¹

Ex. No.	Description
Ex-1001	U.S. Patent No. 8,542,705 (“the ’705 Patent”)
Ex-1002	Declaration of Dr. Brian Anthony
Ex-1003	Curriculum Vitae of Dr. Brian Anthony
Ex-1004	Prosecution History of U.S. Patent No. 8,542,705
Ex-1005	U.S. Patent No. 6,728,965 to Mao (“Mao”)
Ex-1006	U.S. Patent No. 8,630,306 to Liu (“Liu”)
Ex-1007	U.S. Patent No. 7,904,581 to Sherer et al. (“Sherer”)
Ex-1008	U.S. Patent No. 7,965,771 to Wu (“Wu-771”)
Ex-1009	U.S. Patent Publication No. 20020133247A1 to Smith et. al. (“Smith”)
Ex-1010	U.S. Patent No. 8,571,111 to Levy (“Levy”)
Ex-1011	U.S. Patent No. 8,396,113 to Choi (“Choi”)
Ex-1012	U.S. Patent Publication No. 2002/0034374 to Barton (“Barton”)
Ex-1013	U.S. Patent Publication No. 2003/0021346 to Bixby (“Bixby”)
Ex-1014	U.S. Patent No. 9,712,581 to Tinsman (“Tinsman”)
Ex-1015	INTENTIONALLY LEFT BLANK
Ex-1016	INTENTIONALLY LEFT BLANK

¹ Four-digit pin citations that begin with 0 are to the branded numbers added by Disney in the bottom right corner of the exhibits. All other pin citations are to original page, column, paragraph, or line numbers.

Ex. No.	Description
Ex-1017	INTENTIONALLY LEFT BLANK
Ex-1018	INTENTIONALLY LEFT BLANK
Ex-1019	INTENTIONALLY LEFT BLANK
Ex-1020	Claim Mapping Table
Ex-1021	<i>Adeia Techs., Inc. v. The Walt Disney Co.</i> , No. 1:24-cv-01231, Defendants' Supplemental Disclosure of Proposed Claim Constructions (D. Del. Sept. 16, 2025)
Ex-1022	<i>Adeia Techs., Inc. v. The Walt Disney Co.</i> , No. 1:24-cv-01231, Plaintiffs' Initial Proposed Claim Constructions (D. Del. Sept. 5, 2025)

I. INTRODUCTION

Disney Entertainment & Sports LLC (“Petitioner”) requests *inter partes* review (“IPR”) of Claims 1, 2, 4-9, 11-16, and 18-20 of U.S. Patent No. 8,542,705 (“the ’705 Patent”) (Ex-1001), currently assigned to Adeia Guides Inc. (“PO”).

II. MANDATORY NOTICES UNDER 37 C.F.R. §42.8

Real Parties-in-Interest: Petitioner identifies the following real parties-in-interest: Disney Entertainment & Sports LLC, The Walt Disney Company, Disney Media and Entertainment Distribution LLC, Disney DTC LLC, Disney Streaming Services LLC, Disney Platform Distribution, Inc., Bamtech, LLC, Hulu, LLC, and ESPN, Inc.

Related Matters: PO has asserted the ’705 Patent against Petitioner in *Adeia Technologies, Inc., et al. v. The Walt Disney Company, et al.*, No. 1:24-cv-01231-MN (D. Del.) (“Disney litigation”).

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III. FEE AUTHORIZATION

The PTO is authorized to charge any fees due during this proceeding to Deposit Account No. LA500639.

IV. GROUNDS FOR STANDING

Petitioner certifies that the '705 Patent is available for review, and Petitioner is not barred or estopped from requesting review.

V. PRECISE RELIEF REQUESTED

Petitioner requests review and cancellation of Claims 1, 2, 4-9, 11-16, and 18-20 as unpatentable based on the following grounds, supported by a declaration from Dr. Brian W. Anthony. Ex-1002 ¶¶1-32, 43-229; Ex-1003.

Ground	Summary
1	Claims 1, 2, 4-9, 11-16, and 18-20 are obvious over Mao (Ex-1005)
2	Claims 1, 2, 4-9, 11-16, and 18-20 are obvious over Mao in view of Liu (Ex-1006)
3	Claims 1, 2, 4-6, 8, 9, 11-13, 15, and 18-20 are obvious over Sherer (Ex-1007) in view of Wu-771 (Ex-1008)

VI. THE CHALLENGED PATENT

The '705 Patent relates to a method, system, and non-transitory computer readable medium that allegedly “improv[es] the ability of a streaming server to...provide media streams.” Ex-1001, 1:36-39. As shown in Figure 5, a streaming server receives multiple media streams (501) and identifies key frames in the streams

(505) so that when a “connection request is received from a client device, a key frame is selected and provided.” *Id.*, 1:45-48.

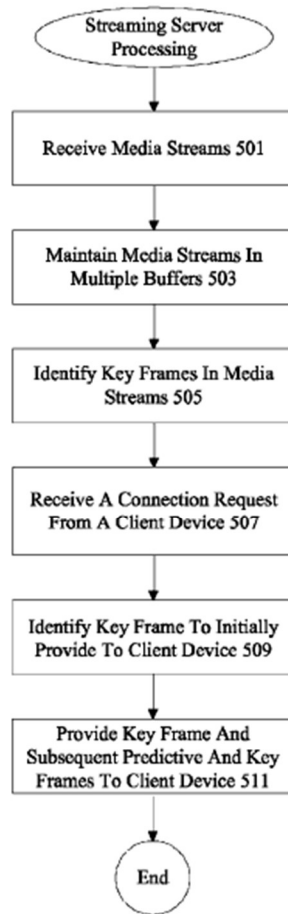


Figure 5

The streaming server receives media streams from a media aggregation server, which is “[a]ny mechanism for obtaining media content from a large number of sources in order to provide the media content to mobile devices in live broadcast streams.” Ex-1001, 6:54-58. As shown in Figure 4 below, the streaming server

(purple²) maintains the media streams in multiple buffers (blue). The “buffer to hold media streams,” may be a first in first out (FIFO) buffer per channel. *Id.*, 3:8-11. Buffers, such as a FIFO buffer, maintain the sequence of frames for the media streams. *Id.*, 4:48-50; *see also id.*, 8:16-24 (“may be individual physical buffers, portions of buffers, or combinations of multiple physical buffers”). The ’705 Patent maintains the sequence of video frames associated with a particular channel in a buffer assigned to each channel, such that buffers or portions of buffers are maintained for separate video streams. *Id.*, 4:13-18.

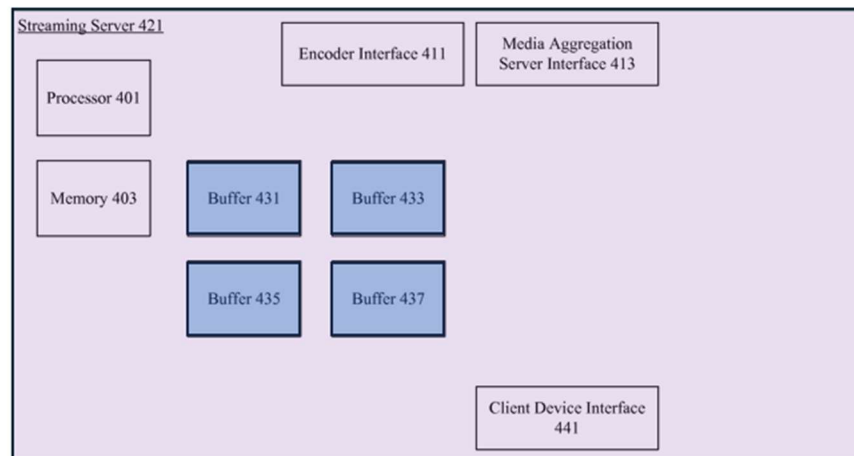


Figure 4

Figure 1 (below) shows a sequence of frames that are received at a streaming server, which include “key frame 101” (red) and predictive frames 103, 105, 107, 109, 111, 113, 115, and 117 (purple). *Id.*, 4:9-12, 4:20-23. A key frame, an “I frame,”

² Throughout, emphasis and annotations are added unless otherwise specified.

is a frame “that includes substantially all of the data needed for a client device to display a frame of video.” *Id.*, 4:20-23. Predictive frames are B-frames and P-frames (purple) and rely on information from a reference key frame. Ex-1001, 2:67-3:7. The sequence of frames, beginning with a key frame and ending with a subsequent key frame is a Group of Pictures (GOP). *Id.*, 4:24-27.

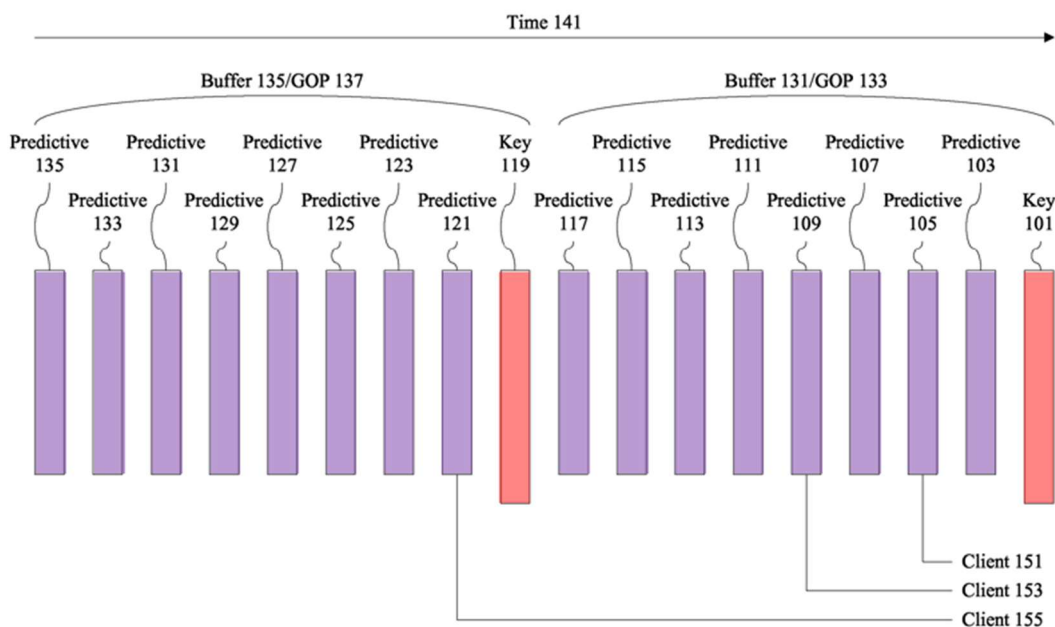


Figure 1

When a connection request such as a channel change, an application launch, or a program purchase (Ex-1001, 8:5-7) is received, the streaming server provides the key frame to be displayed without distortion. Ex-1001, 3:61-4:4. The '705 Patent's technique allegedly provides an “intelligent streaming server that identifies key frames in video streams and provides a key frame initially to a client device.” Ex-1001, 8:10-15; Ex-1002 ¶¶33-37.

VII. PROSECUTION HISTORY OF THE '705 PATENT

The '705 Patent was filed May 26, 2006, as a continuation of International Application PCT/SE04/001540, filed on Oct. 25, 2004.

The '705 Patent was allowed after 6 Office Actions, rejecting the claims under 35 U.S.C. §§ 101, 102, 103 and an interview with the examiner. The applicant continued to argue that the asserted prior art reference, U.S. Patent Publication No. 2007/0044128 A1 to Witt, “converted” the frame that was received, while the claims require the “same key frame received at the streaming server is the key frame provided to the client device.” Ex-1004, 107; *see also id.*, 147, 154. With its request for continued examination, the applicant argued that none of the cited references taught or suggested “disregarding the plurality of predictive frames preceding the key frame maintained in the channel buffer,” “decoding a frame to identify a key frame,” or “transmitting the key frame to the client device in response to the connection request corresponding to the channel change.” *Id.*, 167-168; *see also id.*, 210-211.

On July 29, 2011, the Examiner rejected the amended claims using a combination of Witt, U.S. Patent Publication No. 20110131622 to Wu et al. (“Wu”), and U.S. Patent Publication No. 20070107026 to Sherer et al. (“Sherer”). Ex-1004, 272. The applicant argued that Wu was not applicable prior art because of its filing date (*id.*, 287), further amended the claims (*see, e.g., id.*, 346, 399) for the

independent claims to recite “a plurality of buffers... allocated on a per group of pictures (GOP) basis.” *Id.*, 464-467. The applicant argued that allocating buffers on a GOP basis “allows efficient access of key frames at the beginning of each GOP.” *Id.* On May 22, 2013, the claims were allowed after an Examiner’s amendment reciting that the plurality of buffers are at the streaming server and “determin[e] positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames.” *Id.*, 480. The ’705 Patent issued on September 24, 2013. *Id.*, 500.

The Examiner materially erred by not considering the Sherer and earlier Wu reference (Wu-771) during prosecution because, as demonstrated in Ground 3 below, Sherer in view of Wu-771 renders obvious each limitation of Claims 1, 2, 4-6, 8, 9, 11-13, 15, and 18-20. Ex-1002 ¶¶38-42. It was a material error to not apply Sherer and Wu-771’s teachings to the amended claims during prosecution, especially in view of the applicant’s silence as to Sherer’s teachings and the applicant’s erroneous arguments regarding Wu-771’s applicability as prior art.

In addition to the Sherer-Wu-771 grounds, this Petition presents new arguments and prior art not considered during prosecution, and nothing precludes considering them in the first instance under 35 U.S.C. §325(d).

VIII. LEVEL OF ORDINARY SKILL IN THE ART

A person of ordinary skill in the art at the relevant time (“POSITA”) would have had a bachelor’s degree in electrical engineering, computer science, computer engineering, or a related field, and two-to-three years of experience in the research, design, development, or testing of interactive streaming technologies, computing and software systems user interfaces, and platforms, with additional education substituting for experience and vice versa. Ex-1002 ¶¶24-28.

IX. PRIORITY DATE

For purposes of this proceeding only, Petitioner applies the earliest alleged priority date of the ’705 Patent: January 23, 2007.³ Accordingly, pre-AIA 35 U.S.C. §102 applies and the ’705 Patent was never eligible for PGR.

X. CLAIM CONSTRUCTION

Petitioner identifies the following claim construction issues raised in the concurrent litigation. Ex-1002 ¶¶86-97. Petitioner does not currently believe that any other terms require express construction. Consolidated Trial Practice Guide, 44, 45.

A. “media aggregation server” (Claims 1, 2, 5-7)

The parties have agreed that the “media aggregation server” recited in claims 1, 2, and 5-7 is “any mechanism for obtaining media content from a large number of

³ Petitioner respectfully reserves the right to challenge the priority date in other proceedings.

sources in order to provide the media content to mobile devices in live broadcast streams.” *See* Ex-1021, 2; Ex-1022; Ex-1001, 6:54-58.

B. “key frame” (Claims 1, 2, 5-7)

In the related litigation, Petitioner has proposed that the recited “key frame” in claims 1, 2, 5-7 is “a frame that can be displayed substantially on its own.” Ex-1021, 2; *see* Ex-1001, 2:65-67. PO has proposed that the “key frame” is a “frame that can be displayed substantially on its own (i.e., without reference to other frames).” Ex-1022, 2. As explained below, there is no meaningful difference between these constructions as applied to the prior art references at issue in this petition. Ex-1002 ¶89.

C. “group of pictures (GOP)” (Claims 1, 5)

The parties have agreed that “GOP” is a “sequence of different frame types, beginning with a key frame and ending just before a subsequent key frame.” Ex-1022, 2.

D. “predictive frame” (Claim 1)

The parties have agreed that the “predictive frame” is “a frame that relies on information from a reference key frame.” *See* Ex-1021, 2; Ex-1022; Ex-1001, 2:67-3:2.

E. “wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis” (Claim 1)

In the related litigation, Petitioner has proposed that “a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis” means “the streaming server allocates one or more different buffers for each group of pictures (GOP).” Ex-1021, 2. PO proposed that a “plain and ordinary meaning” should apply. Ex-1022. As explained below, there is no meaningful difference between these constructions as applied to the prior art references at issue in this petition because Petitioner’s proposed construction is consistent with the “plain and ordinary meaning” of the terms. Ex-1002 ¶92.

F. “wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel change request” (Claim 1)

Petitioner has proposed that this limitation is indefinite. *See* Ex-1021. PO has proposed that the limitations are not indefinite. *See* Ex-1022. For the purposes of this proceeding, Petitioner has applied this limitation to include, at least, that in response to a change request, the next available key frame is provided and there are not any predictive frames transmitted at the beginning of the channel change request. Ex-1002 ¶93.

G. “identifying a next available key frame associated with the second media stream” (Claim 1)

Petitioner has proposed that this limitation means “identifying, by the streaming server, by decoding or partially decoding the frame, a next available key frame associated with the second media stream.” Ex-1021, 3. PO argues that this limitation should be given its plain and ordinary meaning. Ex-1022. As explained below, there is no meaningful difference between these constructions as applied to the prior art references at issue in this petition because Petitioner’s proposed construction is consistent with the “plain and ordinary meaning” of the term. Ex-1002 ¶94.

H. Order of steps (Claim 1)

Petitioner proposed that 1[a] and 1[b] must precede 1[c], and 1[c], 1[d], and 1[e] must be performed in order. PO argues that no such order is required. *See* Exs-1021, 1022. As explained below, there is no meaningful difference between these constructions as applied to the prior art references at issue in this petition because the prior art teaches performing the steps in the order recited by the claims. Ex-1002 ¶95.

I. “wherein the first media stream is a first video stream and the second media stream is a second video stream” (Claim 2)

Petitioner has proposed that claim 2 is invalid under 35 U.S.C. § 112 ¶4. *See* Ex-1021. PO has proposed that the plain and ordinary meaning should apply. *See*

Ex-1022. For the purposes of this proceeding, Petitioner has applied this claim to mean that the first media stream is a first video stream and the second media stream is a second video stream because the media stream, as recited in Claim 1, includes a plurality of frames and therefore is a video stream. Ex-1002 ¶96.

XI. BRIEF DESCRIPTION OF THE APPLIED PRIOR ART

A. Mao (Ex-1005)

Mao (U.S. Patent No. 6,728,965) was filed on August 20, 1997, issued on April 27, 2004, and is prior art to the '705 Patent under at least §102(a), (b), (e). Ex-1002 ¶¶71-75.

Mao discloses a “method and apparatus [for] rapidly changing the channel in a digital video delivery system.” Ex-1005, 2:26-28; *see also id.*, 1:7-10. Mao teaches a “rapid channel changer” that receives a “subscriber’s channel change request” and assess and directs the corresponding video signal to the subscriber. Ex-1005, Abstract. For example, when a subscriber makes a channel change request, *e.g.* to channel X, using set-top unit 19 (yellow, below), the request is sent to broadband digital terminal 12 (BDT). Ex-1005, 5:51-57. Specifically, Mao’s BDT 12 (purple) is connected to broadband network unit 14 (BNU), which “bundles all of the received control signals from the ... set-top units it serves and transmits them to the BDT.” Ex-1005, 6:10-12. BDT 12 is “connected to a video source (ATM network

26 or special network 32 [(green)]) that provide a plurality of compressed video signals.” Ex-1005, 7:62-64.

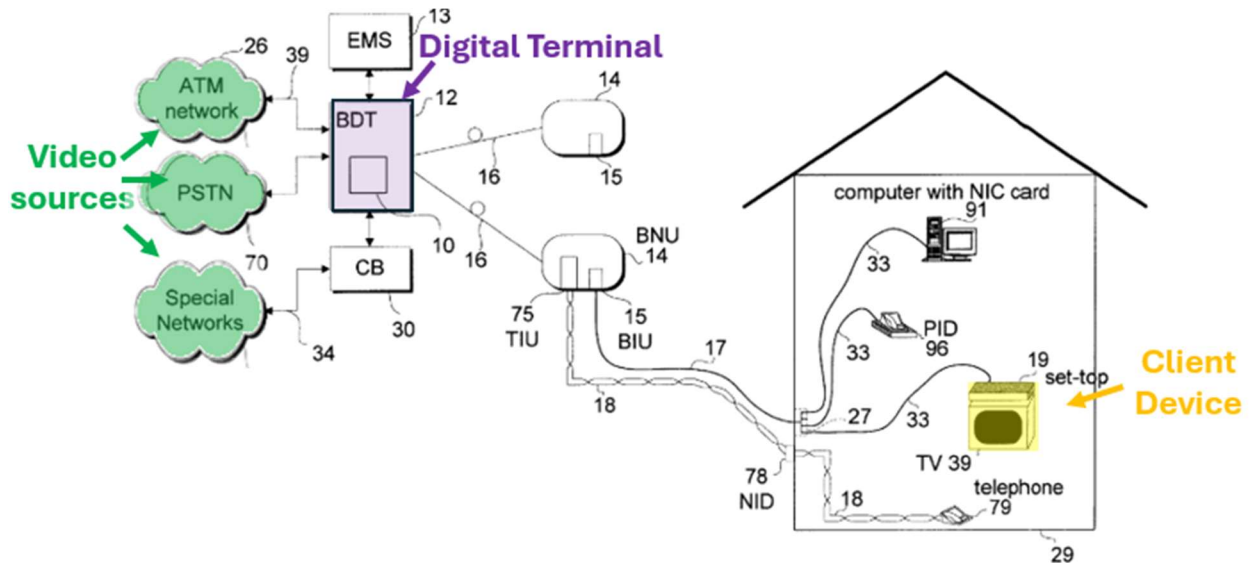


FIG. 1

The BDT receives video signals comprising “a continuous stream of a predetermined number of consecutive data frames.” *Id.*, 10:12-13 (Cl. 5). Mao explains that the Group of Pictures (GOP) starting point is coded by an “I” or “intracoded frame[]” and followed by “predicted frames and bidirectional frames (P and B frames, respectively).” *Id.*, 7:29-31. As shown in Figure 7 below, BDT 12 includes a “first-in-first-out (FIFO) buffer 50 for storing the compressed video data of each video channel.” Ex-1005, 8:14-16. Mao provides an example that “forty FIFO buffers 50 will be used” when a subscriber has “forty channels from which to choose.” *Id.*, 8:59-62; *see also id.*, 8:17-21 (BDT 12 utilizes buffers to store the video

data for each channel it is supposed to receive.”), 8:39-41 (“multiple buffer memory units may be used, e.g., one for each video channel”).

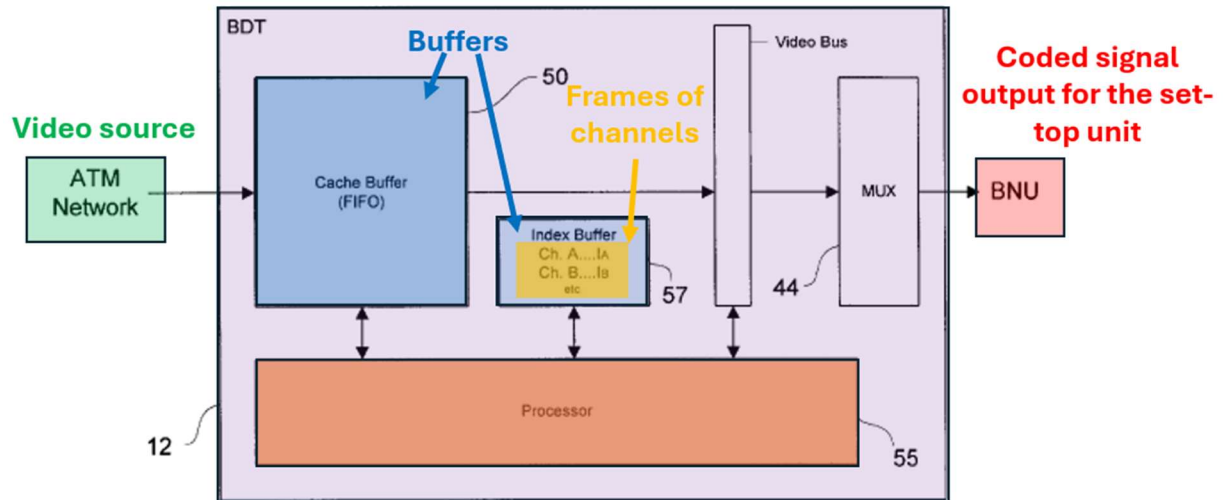


FIG. 7

BDT 12’s processor 55 (orange) receives the frames for each channel and detects, establishes, and records the GOP start frame for each channel. *Id.*, 8:15-26. Each I frame (start frame) is separated from the next I frame “by a pre-determined number of other frames.” Ex-1005, 7:34-36. Mao further teaches that two or more synchronization frames per video signal can be determined and maintained. Ex-1005, 9:2-6. Mao specifically provides that in a MPEG-2 scheme with a GOP size of fifteen, up to thirty frames can be stored. *Id.*

Therefore, once the set-top unit’s channel change request is received and determined proper by the BDT, the BDT then “direct[s] the corresponding video data downstream to the appropriate set-top unit 19.” Ex-1005, 5:55-65. BDT

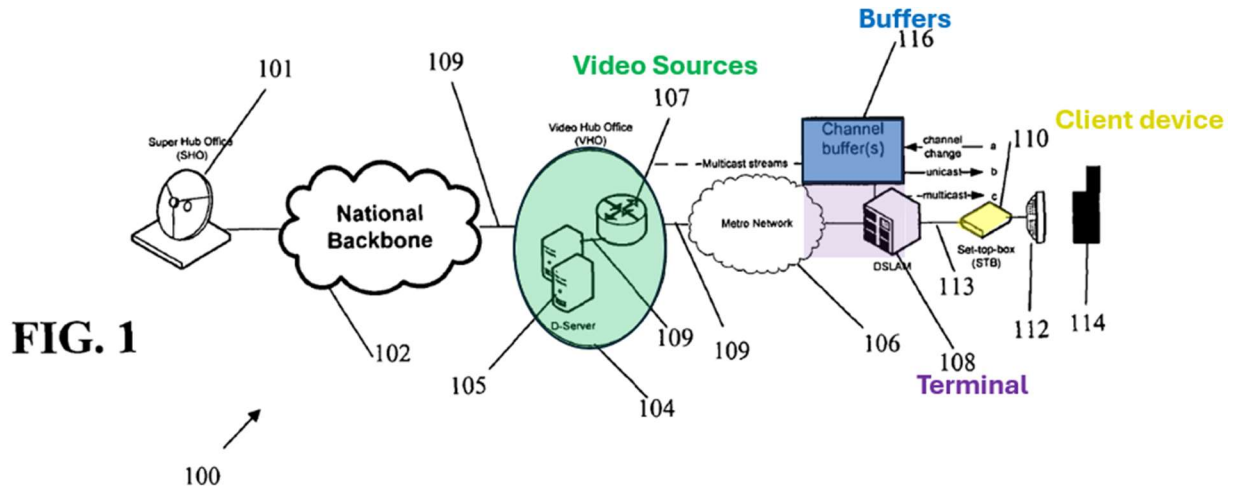
synchronizes with “channel X as it is received from the ATM network” by decompressing and multiplexing the channel. *Id.*, 6:20-26. Specifically, the BDT “must then wait for the Group of Picture (GOP) start point of the requested channel.” Ex-1005, 7:8-12. The GOP start point is coded in the “I” or intracoded frames. *Id.*, 7:29-30. Thus, when “a change of channel request reaches BDT 12, the processor can immediately look up the location of the I frame from the pointer location buffer 57 and immediately access the appropriate video data.” Ex-1005, 8:52-55.

B. Liu (Ex-1006)

Liu (U.S. Patent No. 8,630,306) was filed on January 9, 2006 and issued January 14, 2014, and is prior art to the '705 Patent under 35 U.S.C. §102(e). Ex-1002 ¶¶76-79.

Liu teaches “a computer program embedded in a computer readable medium that contains instructions operative to be executed by a processor,” “a method for providing video content,” and “a network element that is operative to provide content to a user in a network.” Ex-1006, 2:25-27, 2:50-52, 2:65-66. As shown in Figure 1 below, Liu teaches an Internet Protocol Television (IPTV) Service Architecture 100 with a Digital Subscriber Line Access Multiplexer (DSLAM) 110 (purple), which “perform[s] traffic aggregation, grooming, policing, access multiplexing and other tasks,” such as receiving media streams from the video hub office. *Id.*, 3:46-49. Liu’s “video hub office” (green) includes server 105, router 107,

and transport links 109 that sends media content through the network to channel buffer device 116 before being distributed to the user via DSLAM 108. Ex-1006, 3:62-65, 4:57-66, 5:19-27. DSLAM 108 provides the I-frames, B-frames, and/or P-frames to each user. *Id.*, 5:21-22.



Liu's IPTV Service Architecture 100 also comprises "channel buffer device 116" (blue), which includes "channel buffer(s)." Ex-1006, 4:1-3, Fig. 1. Channel buffer device 116 "include[s] memory for buffering data streams including I-frames" (*id.*) and may "utilize any suitable storing scheme." *Id.*, 4:66-5:1. The buffers "may receive and buffer the latest frames for a channel up to the most recent 'N' I-frames, where N may be as small as 1." *Id.*, 4:46-48. Channel buffer device 116 "may further include ... programs or instructions that detect channel changes received via a client premise equipment, such as STB 110, a processor and computer programs or instructions that provide the stored I-frame to the DSLAM in response to a customer

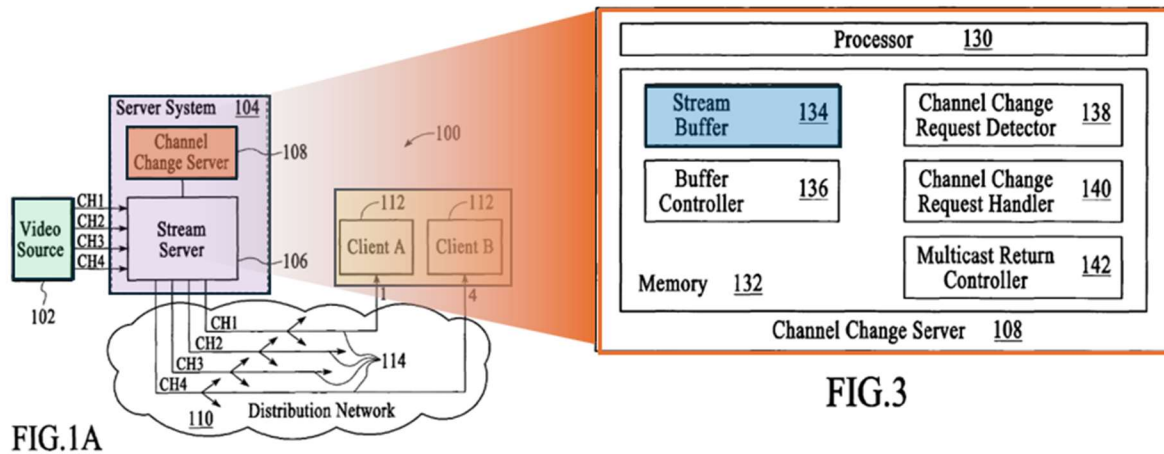
event, such as a change of a channel.” *Id.*, 4:1-7. The channel buffer device’s functions may be integrated into the DSLAM. *Id.*, 4:7-10.

Liu also teaches detecting a user’s particular channel selection and then determine whether a stored I-frame corresponding to the channel resides within the memory to provide a signal to the user. Ex-1006, 9:12-23.

C. Sherer (Ex-1007)

Sherer (U.S. Patent No. 7,904,581) was filed on February 23, 2006 and issued March 8, 2011, and is prior art to the ’705 Patent under 35 U.S.C. §102(e). Ex-1002 ¶¶80-82.

Sherer teaches a “method for servicing channel change requests in a digital video network that is capable of distributing digital video content to clients.” Ex-1007, 6:35-38, 14:62-65 (Cl. 1). As shown below in Figures 1A and 3, Sherer’s server system 104 (purple) includes stream server 106 and channel change server 108 (orange), which includes processor 120, memory 143, stream buffer 134 (blue), and buffer controller 136. Ex-1007, 7:6-15. Sherer’s server system 104 ingests the digital video content from the video source (green) and controls the distribution of the digital video content into the distribution network. Ex-1007, 4:29-31. Stream buffer 134 “buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” *Id.*, 8:60-64.



As shown below in Figure 5, Sherer’s streaming server “ingests” the digital video content, block 601 (green), and “portions of each channel are buffered by the channel change server for use in servicing channel change requests.” *Id.*, 7:56-61. At block 602, digital video content is provided to the client and, at block 604 (blue), “multiple consecutive frames of digital video content, including at least one I-frame are buffered.” *Id.*, 7:59-63. Once a channel request is initiated by the client device, block 608, and received by the channel change server in the stream server, block 610 (red), “buffered frames for the requested channel are provided to the client,” block 612 (yellow). Ex-1007, 7:66-8:2. Specifically, “the buffered frames are provided starting at the first buffered I-frame and the digital video content continues to be provided to the client via unicasting until a pre-established condition is met.” *Id.*, 8:2-5.

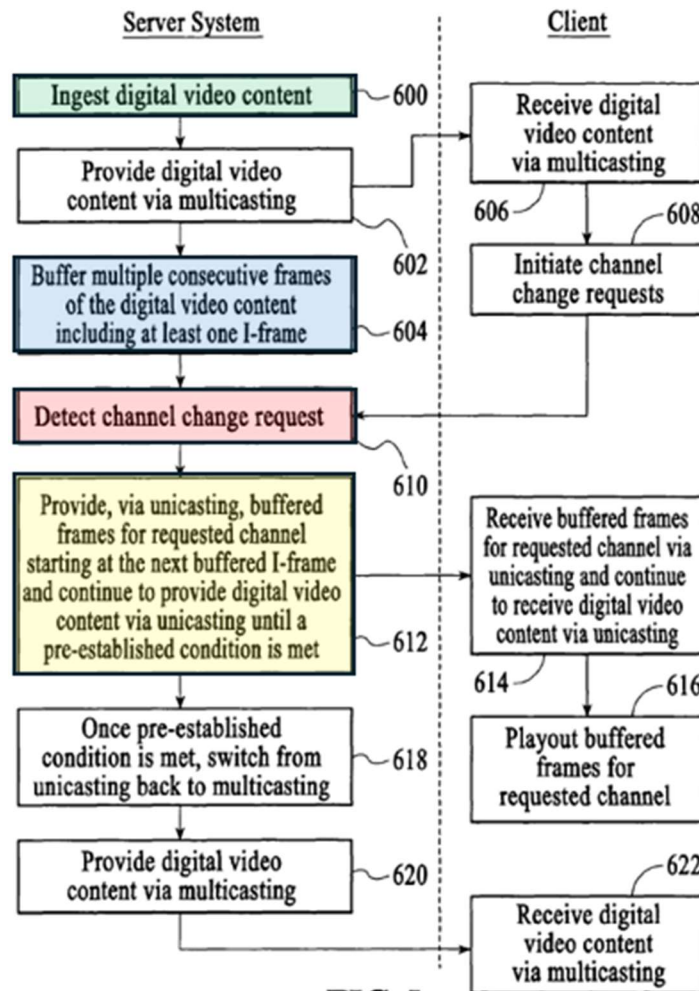


FIG.5

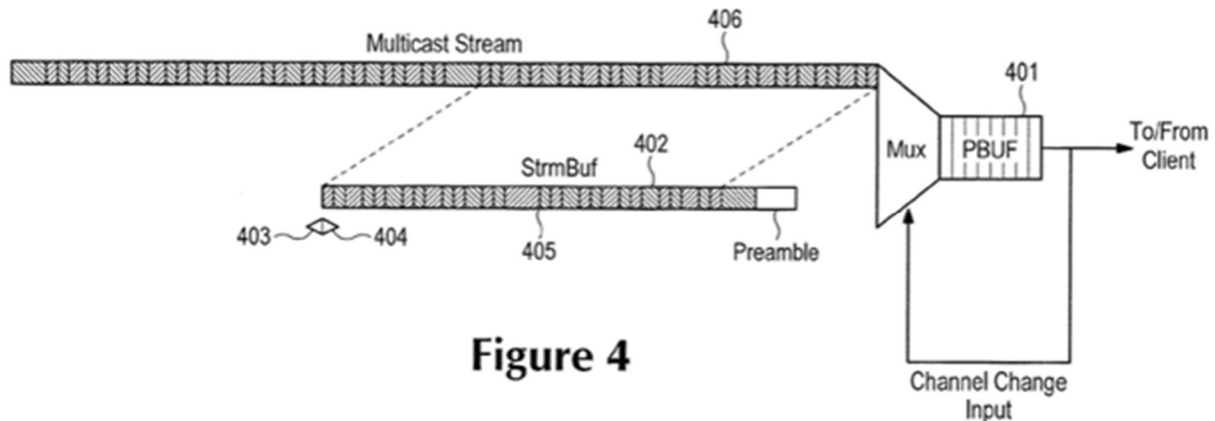
D. Wu-771 (Ex-1008)

Wu-771 (U.S. Patent No. 7,965,771) was filed February 27, 2006 and issued June 21, 2011, and is prior art to the '705 Patent under 35 U.S.C. § 102(e). Ex-1002 ¶¶83-85.

Wu-771 teaches a method and apparatus for minimizing delays when displaying video for a channel change. Ex-1008, Cls. 1, 11. Wu-771 teaches that a commonly used approach for minimizing the bandwidth requirements associated

with transmitting video entails compressing the video through a video compression scheme, transmitting the smaller compressed video data, and then decompressing the video data before being displayed. Ex-1008, 1:54-58. Wu-771 teaches that the Moving Pictures Expert Group (MPEG) video compression standard converts a video stream into I, P, and B frames. *Id.*, 1:58-62. Wu-771 further teaches that “Group of pictures is defined as the number of I, P, B frames that are sent prior to the next I frame.” Ex-1008, 3:63-64. For example, a “typical Group of Pictures (GOP) ... contains I, P and B frames” where an I frame is followed by fourteen B and P frames. *Id.*, 3:65-4:2.

Wu-771 includes a “video acceleration module VAM,” which buffers the frames. *Id.*, 4:66-67. As shown in Figure 3 below, Wu-771’s VAM has “separate outgoing client buffers for each client port (PBUF) 401” and “fixed buffers for each multicast stream it is sourcing to clients, referred to herein as Streaming Buffers (StrmBuf).” Ex-1008, 4:67-5:3. Wu-771’s StrmBuf 402 buffers a “fixed number of GOP’s aligning the start of the buffer to the start of a GOP.” *Id.*, 5:3-6. Wu-771 teaches that “the higher number of I frames sent, the faster the decoder can start displaying the picture (i.e., faster channel change time form a user perspective), since the decoder needs an I frame to initially sync to; again.” Ex-1008, 3:59-61.



XII. DETAILED EXPLANATION OF THE UNPATENTABILITY GROUNDS

A. Grounds 1/2: Claims 1, 2, 4-9, 11-16, and 18-20 are obvious over Mao or Mao further in view of Liu.

1. A POSITA would have been motivated to combine Mao's and Liu's teachings and would have had a reasonable expectation of success.

A POSITA would have been motivated to combine the teachings of Mao and Liu ("Mao-Liu") and had a reasonable expectation of success in doing so because each relates to providing a video stream to a client device in response to a channel change request. Ex-1005, Title, Abstract; Ex-1006, Title, Abstract; Ex-1002 ¶¶98-109.

Mao teaches a method and apparatus that "rapidly chang[es] the channel in a digital video delivery system." Ex-1005, 2:26-28; *see also id.*, 1:7-10. Mao's digital video system includes broadband digital terminal 12 (BDT, purple) that is "connected to a video source (ATM network 26 or special network 32) that provide

a plurality of compressed video signals.” Ex-1005, 7:62-64. As shown in Figure 7 below, BDT 12’s processor 55 (orange) receives the frames for each channel and detects, establishes, and records the GOP start frame (I frames, yellow) for each channel. *Id.*, 8:15-26. Compressed video data of each channel is stored in a buffer on BDT 12 (blue), where a buffer unit is used for each video channel. Ex-1005, 8:14-26, 8:37-42. BDT 12 includes a “first-in-first-out (FIFO) buffer 50 for storing the compressed video data of each video channel.” Ex-1005, 8:14-16. Mao provides an example in which “forty FIFO buffers 50 will be used” when a subscriber has “forty channels from which to choose.” *Id.*, 8:59-62; *see also id.*, 8:17-21 (BDT 12 “utilizes buffers to store the video data for each channel it is supposed to receive”), 8:39-41 (“multiple buffer memory units may be used, e.g., one for each video channel”).

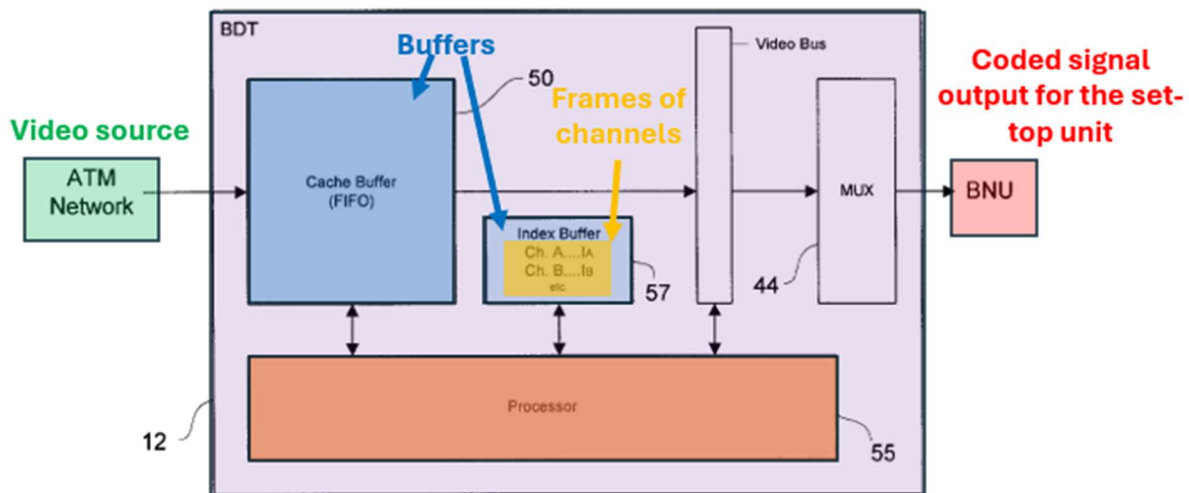
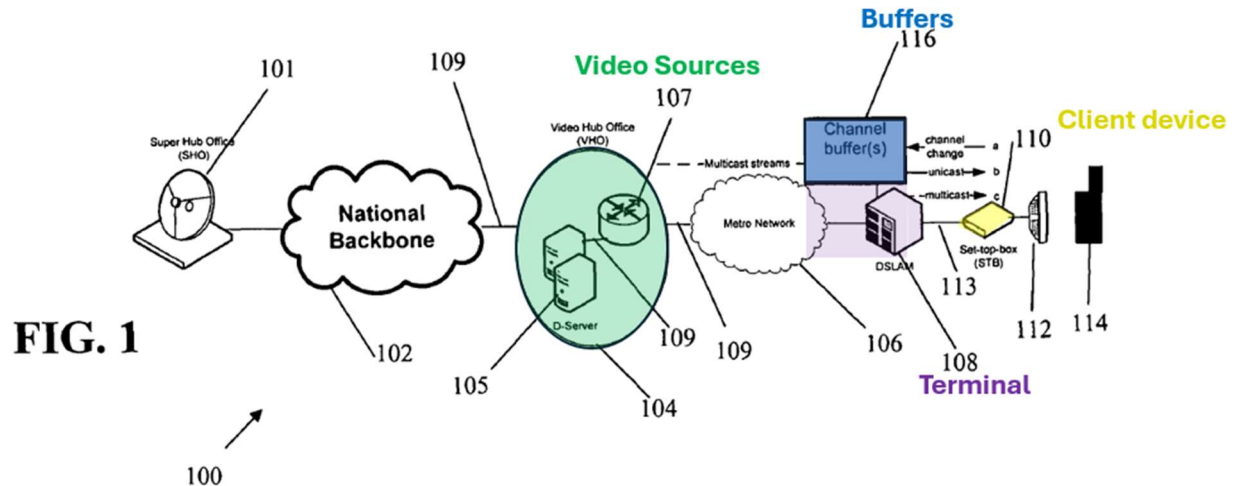


FIG. 7

Additionally, Liu teaches an Internet Protocol Television Service Architecture 100, which includes a “video hub office” (green) that includes multiple servers 105,

router 107, and transport links 109 to send media content through the network to the channel buffer device 116 (blue) before being distributed to the user's set-top box 110 (yellow) via the Digital Subscriber Line Access Multiplexer (DSLAM) 108 (purple). Ex-1006, 3:62-65, 4:57-66, 5:19-27.



Liu's "channel buffer device 116" (blue) includes "channel buffer(s)" (Ex-1006, 4:1-3, Figure 1) and may be included in the DSLAM. *Id.*, 4:7-10. The channel buffer device 116 "include[s] memory for buffering data streams including I-frames" (*id.*) and may "utilize any suitable storing scheme." *Id.*, 4:66-5:1. The plurality of buffers "may receive and buffer the latest frames for a channel up to the most recent 'N' I-frames, where N may be as small as 1." *Id.*, 4:46-48. The channel buffer device 116 includes "programs or instructions that detect channel changes received via a client premise equipment, such as STB 110, a processor and computer programs or instructions that provide the stored I-frame to the DSLAM in response to a customer event, such as a change of a channel." *Id.*, 4:1-7.

First, a POSITA would have been motivated to receive video streams from one or more servers, such as those in Liu's video hub office 104, in order to have the video streams from the national backbone and super hub office stored closer to the terminal. This would, for example, minimize transmission delays in providing the requested channel to the user. Ex-1002 ¶¶99-102. While a POSITA would have understood Mao's ATM network 26 or special network 32 video sources (Ex-1005, 7:62-64) include a server, Liu provides a specific example of a well-known teaching of one or more video servers providing the video stream. Ex-1002 ¶102.

Second, a POSITA would have been motivated to maintain Mao's video frames for each video stream in separate buffers at its BDT on a per GOP basis, as taught by Liu. Ex-1002 ¶¶103-104. A POSITA would have understood that Mao's BDT 12 ("streaming server") allocates one or more different buffers for each group of pictures (GOP) when maintaining the starting frame (I frame) for each channel in a buffer. A POSITA would have further understood that Liu provides an example of this well-known approach. *Id.* Specifically, Liu teaches that each channel has its own buffer to maintain its frames according to the encoding scheme to ensure that an I-frame is maintained with its proceeding predictive frames. Ex-1006, 4:35-40. For example, Liu teaches that its channel buffers store "the latest frames for a channel up to the most recent 'N' I-frames, where N may be as small as 1." *Id.*, 4:46-48. A POSITA would have been motivated to store each channel as a sequence of different

frame types in an allocated buffer, beginning with a key frame and ending just before a subsequent key frame, as taught by Liu. This would ensure that each channel's most recent I-frames are stored and can be provided to the user upon request, thus eliminating delays that would otherwise occur to fetch, identify, and further process the video stream to be provided to the user's device and prevent distorted videos from being presented to the user. Ex-1006, 1:42-52; Ex-1002 ¶¶103-104.

A POSITA would have had a reasonable expectation of success in combining the teachings of Mao and Liu. Ex-1002 ¶¶104-108. Indeed, as shown below in Modified Figure 7' below, Liu's VHO and channel buffers would have been implemented in conjunction with Mao's architecture to carry out the same functions that Mao is already performing, while achieving the additional benefits taught by Liu. *Id.*

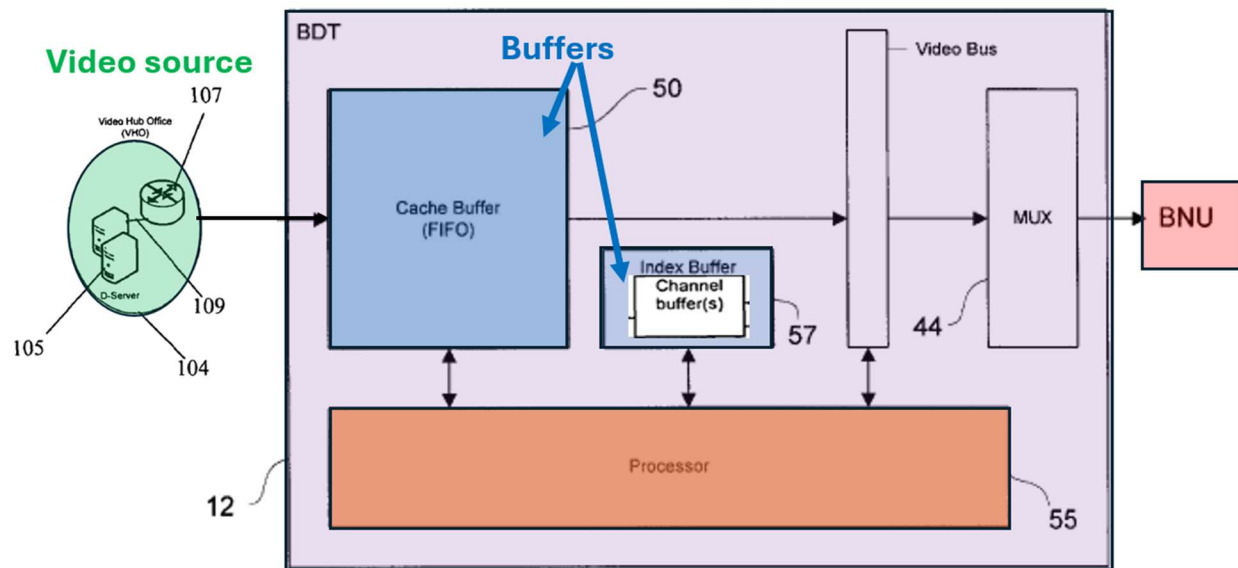


FIG. 7'

Moreover, both references describe methods for receiving video data streams, identifying and storing the I-frames and predictive frames, and providing the channel requested by the user using similar hardware and software components. Ex-1005, Title, Abstract; Ex-1006, Title, Abstract. A POSITA would thus have understood that these references disclose interrelated teachings based on well-understood technologies that would have been amenable to various well-understood and predictable combinations, which combinations achieve the benefits taught by each reference. Ex-1002 ¶¶104-109.

2. Independent Claims 1 and 15

a. Element 1[pre]: A method:

Element 15[pre]: A non-transitory computer readable medium, comprising:

Ground 1: Mao teaches the preambles of claims 1 and 15 to the extent that they are limiting. Ex-1002 ¶110.

Mao teaches a “method and apparatus that rapidly changing the channel in a digital video delivery system.” Ex-1005, 2:26-28; *see also id.*, 1:7-10. A POSITA would have understood that Mao’s method, which is executed by a computer processor, would have been implemented using non-transitory computer readable medium that provides the instructions executed by the processor. Ex-1002 ¶110.

Ground 2: Mao-Liu teaches the preamble of claim 15, to the extent it is limiting. Ex-1002 ¶111.

Liu expressly discloses an example of a well-known teaching by explaining that “a computer readable medium containing instructions operative to be executed in a computer containing a processor.” Ex-1006, 7:28-31. A POSITA thus would have implemented Mao’s processor to execute appropriate computer readable instructions, as taught by Liu. Ex-1002 ¶111.

- b. Elements 1[A]/15[A]: [(i)] [receiving]/[computer code for receiving] a first media stream including a first plurality of frames, [(ii)] the first media stream received at a streaming server and maintained in a first buffer, the streaming server configured to receive the first media stream from a media aggregation server, [(iii)] wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;**

Ground 1: Mao teaches elements 1[A] and 15[A]. Ex-1002 ¶¶112-120.

Mao teaches “receiving a first media stream including a first plurality of frames.” For example, Mao teaches a “digital video system receiving video data corresponding to a plurality of video channels.” Ex-1005, 10:8-9 (Cl. 5). Specifically, Mao’s broadband digital terminal (BDT 12) receives “a plurality of compressed video signals” from a video service provider. Ex-1005, 7:62-64, 3:38-42. BDT 12 receives this media stream comprising a “continuous stream of a predetermined number of consecutive data frames.” *Id.*, 10:12-13 (Cl. 5). Mao explains that the received media stream includes a plurality of frames by being grouped into Groups of Picture (GOPs), starting with an “I” or “intracoded frames” followed by “predicted frames and bidirectional frames (P and B frames,...).” *Id.*, 7:29-31; Ex-1002 ¶¶113-114 (citing Ex-1006, 4:14-18 (“I-frames or ‘infraframes,’ (also known as ‘*key frames*’ or ‘index frames.’)”), Ex-1008, 1:58-2:9, Ex-1012 ¶12); Ex-1001, 3:3-7 (“MPEG and its various incarnations use I-frames as key frames”), 9:58-59 (Cl. 6) (“the key frame is an I-frame.”).

In Mao, “the first media stream received at a streaming server [is] maintained in a first buffer.” Specifically, Mao’s BDT is a streaming server with a plurality of buffers. As shown in Figure 7 below, Mao’s BDT 12 includes a “first-in-first-out (FIFO) buffer 50 for storing the compressed video data of each video channel.” Ex-1005, 8:14-16. Mao provides an example that “forty FIFO buffers 50 will be used” when a subscriber has “forty channels from which to choose.” *Id.*, 8:59-62. Mao’s

BDT is streaming server because it includes a processor 55, memory, buffers, and interface operable to receive media streams, such as video streams, and a client device interface that provides the channels to the client device. Ex-1005, 3:34-42, 8:14-27; Ex-1002 ¶¶115-116; Ex-1001, 7:58-8:2.

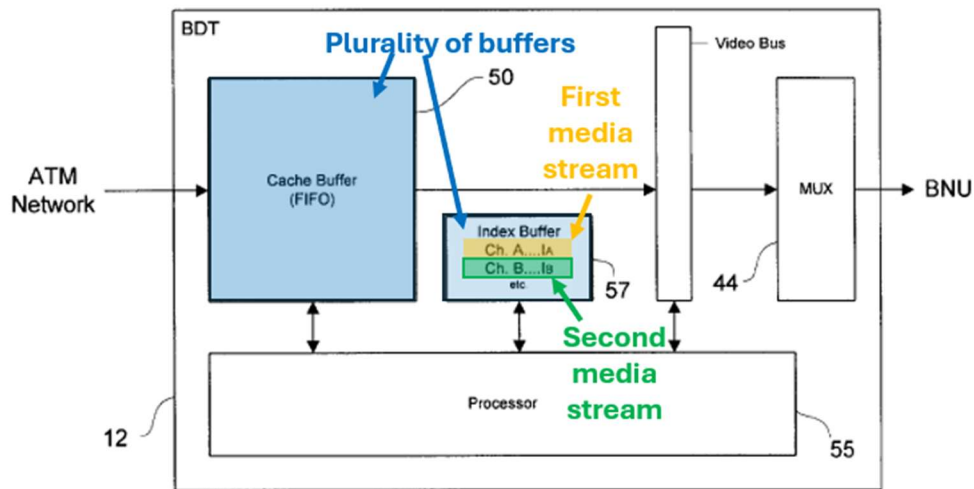


FIG. 7

In Mao, “the streaming server [is] configured to receive the first media stream from a media aggregation server.” As discussed in §X, above, a “media aggregation server” is defined in the specification as “any mechanism for obtaining media content from a large number of sources in order to provide the media content to mobile devices in live broadcast streams is referred to herein as a media content aggregation server.” Ex-1001, 6:54-58. Specifically, Mao’s BDT 12 (streaming server) is “connected to a video source ([Asynchronous Transfer Mode (ATM)] network 26 or special network 32) that provide a plurality of compressed video

signals.” Ex-1005, 7:62-64. Mao’s ATM or special network is a “media aggregation server” because it is the “mechanism for obtaining media content from a large number of sources in order to provide the media content ... in live broadcast streams” as defined in the specification. Ex-1002 ¶117; Ex-1001, 6:54-58.

Additionally, Mao’s “plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis.” As discussed in §X, above, Petitioner’s proposed construction is “wherein the streaming server allocates one or more different buffers for each group of pictures (GOP).” Ex-1021, 2. “GOP” is a “sequence of different frame types, beginning with a key frame and ending just before a subsequent key frame.” Ex-1022, 2. Mao’s BDT 12 stores the pointer for each GOP start frame (I frame) for each channel “in a second buffer 57.” Ex-1005, 8:22-26. The GOP starting point is coded as “I” or “intracoded frames,” which are then followed by “predicted frames and bidirectional frames (P and B frames, respectively).” *Id.*, 7:29-31. While Mao’s Figure 1 shows a single FIFO and second buffer 57, Mao teaches that BDT 12 “**utilizes buffers** to store the video data **for each channel** it is supposed to receive.” *Id.*, 8:17-21. Indeed, “**multiple buffer memory units may be used**, e.g., one for each video channel.” *Id.*, 8:39-31. Mao thus teaches one or more different buffers for the multiple channels received on a GOP basis because Mao teaches that, based on the minimum number of frames in the compression scheme, “**at least one GOP frame for each video channel** is stored at

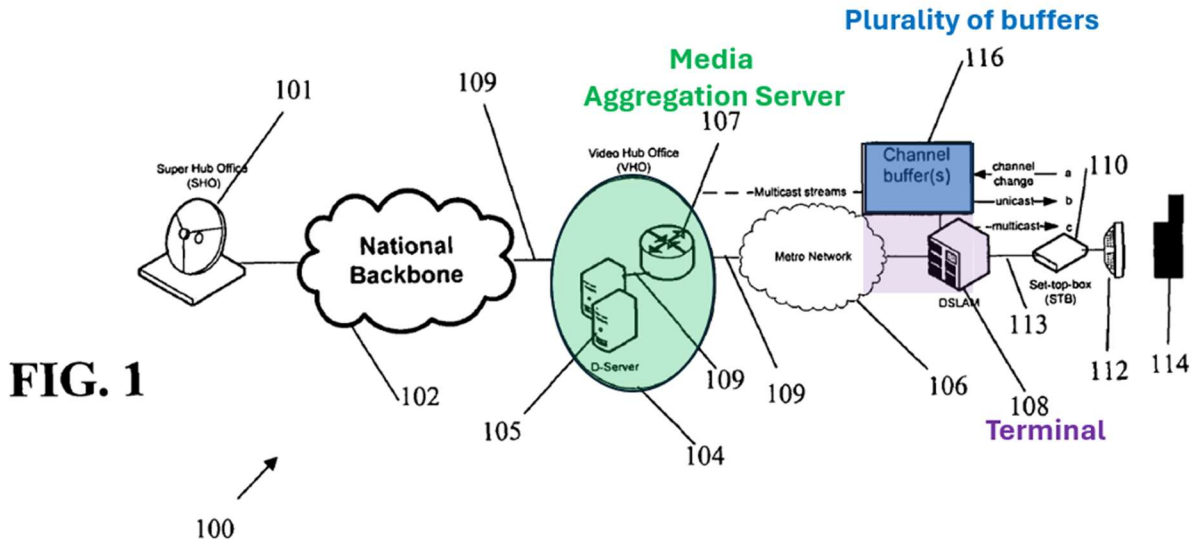
all times in the buffer.” *Id.*, 8:29-33, 8:37-42; Ex-1002 ¶¶118-120; *see also* Ex-1001, 3:9-11 (“a streaming server includes a first in first out (FIFO) buffer per channel of video received”). Therefore, Mao’s BDT 12 (“streaming server”) allocates one or more different buffers for each group of pictures (GOP) by maintaining a sequence of a frames starting with the pointer starting frame (I frame) followed by other frames (B and P frames) for each channel in a buffer, even under PO’s proposed construction.⁴ Ex-1002 ¶120.

Ground 2: Mao-Liu teaches elements 1[A] and 15[A]. Ex-1002 ¶¶121-127.

While Mao teaches implementing buffers on a per GOP basis, Liu teaches further implementation details of allocating buffers on a per GOP basis. Ex-1002 ¶122. Specifically, a POSITA would have been motivated to implement Mao’s BDT’s multiple buffers to be allocated on a GOP basis, as taught by Liu. As shown in Figure 1 below, Liu’s “channel buffer device 116” includes “channel buffer(s).” Ex-1006, 4:1-3, Fig. 1. Liu’s channel buffer device 116 “includes memory for buffering data streams including I-frames” (*id.*) and may “utilize any suitable storing scheme.” *Id.*, 4:66-5:1. The plurality of buffers “may receive and buffer the latest frames for a channel up to the most recent ‘N’ I-frames, where N may be as small as

⁴ As discussed in §X, PO proposed the plain and ordinary meaning for the streaming server’s plurality of buffers and that the GOP is a “sequence of different frame types, beginning with a key frame and ending just before a subsequent key frame.” Ex-1022, 2.

1.” *Id.*, 4:46-48. In the example where $N=1$, Liu’s buffer would thus include a single GOP (a single I-frame and associated P and B frames). Ex-1002 ¶122.



Moreover, while Mao teaches that the streaming server receives video signals from a media aggregation network, which would have been understood as a “media aggregation server” as defined in the specification, Liu explicitly teaches that the video streams are provided by one or more “servers.” Ex-1001, 6:54-58; Ex-1002 ¶123. Specifically, Liu’s “video hub office” includes servers 105, router 107, and transport links 109 that sends media content through the network to the channel buffer device 116 before being distributed to the user. Ex-1006, 3:62-65, 4:57-66, 5:19-27.

The combined Mao-Liu system discussed in Ground II would thus have been implement as shown in Figure 7’ below. Specifically, Liu’s VHO’s servers provide the video streams to Mao’s BDT just like Mao’s video sources (networks 26, 32)

provide a plurality of compressed video signals. Ex-1005, 7:62-64. Additionally, Liu's channel buffers would have been implemented on Mao's index buffer 57 as to maintain Mao's I frame for each channel, including a single GOP in some examples (e.g., when N=1) as taught by Liu. *Id.*, 8:17-21, 8:39-31. Therefore, Liu's VHO and channel buffers would have been implemented in conjunction with Mao's architecture to carry out the same functions that Mao is already performing, while achieving the additional benefits taught by Liu. Ex-1002 ¶124-126.

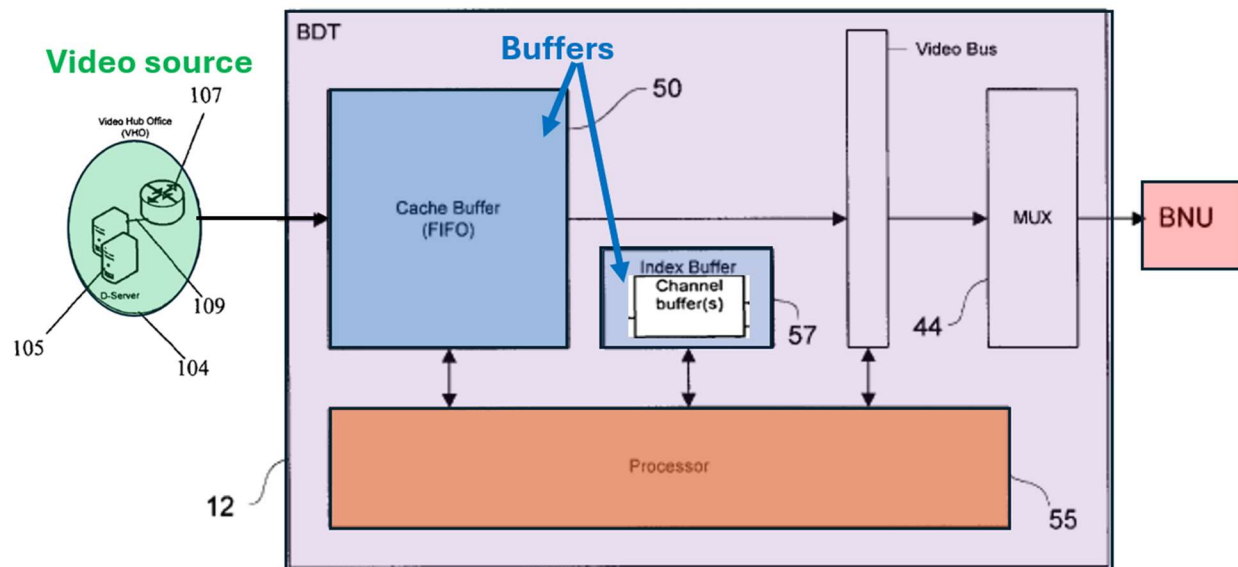


FIG. 7'

A POSITA would have been motivated, and have had a reasonable expectation of success, to implement Mao-Liu this way as explained in §XII.A.1 (motivation). Ex-1002 ¶¶125-127.

- c. **Elements 1[B]/15[B]: [receiving]/[computer code for receiving] a second media stream including a second**

plurality of frames, the second media stream received at the streaming server and maintained in a second buffer;

Ground 1: Mao teaches elements 1[B] and 15[B]. Ex-1002 ¶¶128-129.

Mao teaches “receiving a second media stream including a second plurality of frames,” which is “maintained in a second buffer.” As explained in the previous section, Mao’s BDT 112 (streaming server) receives video signals for multiple channels (e.g., Ch. A, Ch. B., etc.). Ex-1005, 7:62-64, 3:38-42, 10:8-9 (Cl. 5). BDT 12’s processor 55 receives the frames for each channel and detects, establishes, and records the GOP start frame (I frame) for each channel. *Id.*, 8:14-26. Compressed video data of each video channel is stored in a buffer on BDT 12, where each buffer unit is used for each video channel. Ex-1005, 8:14-26, 8:37-42. The second video stream made of a plurality of frames (green) is therefore maintained in a second buffer specific for that video channel. Ex-1002 ¶129.

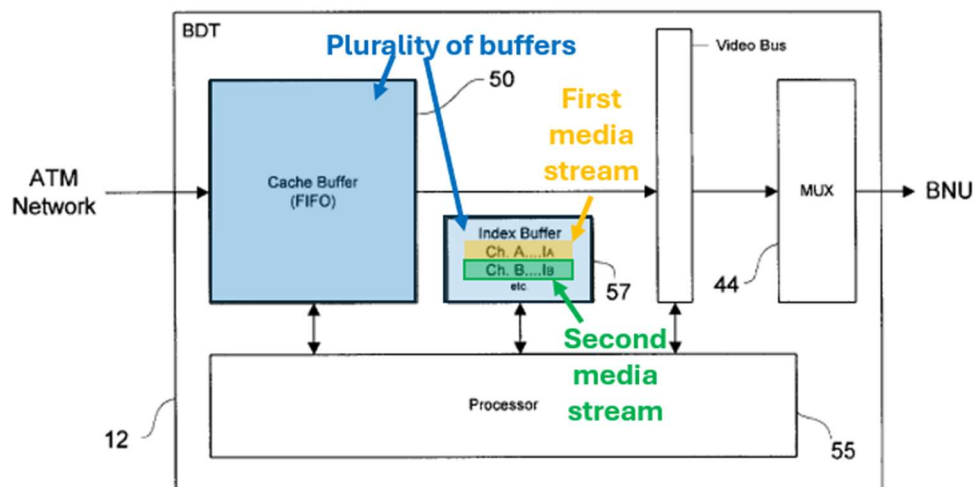
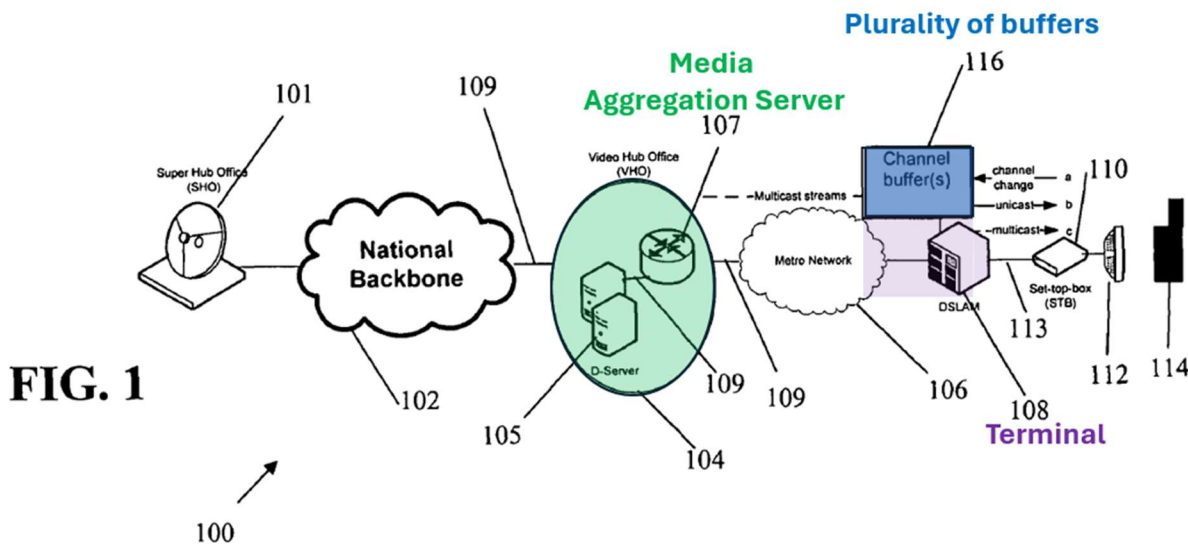


FIG. 7

Ground 2: Mao-Liu teaches elements 1[B] and 15[B]. Ex-1002 ¶¶130-131.

While Mao teaches implementing buffers for each video stream, Liu teaches further implementation details relating to storing a second stream in a second set of buffers. Ex-1002 ¶131. Specifically, Liu teaches to use “channel buffers” to store video streams for different channels. Ex-1006, 4:1-3, Fig. 1. A POSITA would have been motivated to maintain Mao’s second video stream, including its plurality of frames, in a separate channel buffer, as taught by Liu, as explained in §XII.A.1. Ex-1002 ¶131.



- d. **Elements 1[C]/15[C]: [(i)] [determining]/[computer code for determining] positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, [(ii)] wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key**

frame as subsequent key frames;

Ground 1: Mao teaches elements 1[C] and 15[C]. Ex-1002 ¶¶132-135.

Mao determines “positions of a plurality of key frames in the first and second buffer.” Ex-1002 ¶133. As discussed in §X, “key frame” is a “frame that can be displayed substantially on its own.” Ex-1001, 2:65-67. Mao’s BDT 12’s processor 55 receives the frames for each channel and detects, establishes, and records the GOP start frame (I frame) for each channel. Ex-1005, 8:15-26. The GOP start frame (I frame) corresponds to the claimed “key frame” because it is the starting pointer of each video, as is well understood in the art. Ex-1005, 8:22-26; Ex-1002 ¶133 (citing Ex-1006, 4:14-18 (“I-frames or ‘infraframes,’ (also known as ‘*key frames*’ or ‘index frames.’) are independently decodable, and store all the data required to display a frame.”), Ex-1008, 1:58-2:9, Ex-1012 ¶12, Ex-1011, 2:55-63); Ex-1001, 3:3-7 (“MPEG and its various incarnations use I-frames as key frames”), 9:58-59 (Cl. 6) (“the key frame is an I-frame.”).

Mao teaches storing a first key frame in the first buffer and a second key frame in the second buffer. For example, Mao teaches that “the minimum number of frames in the compression scheme” is held “so that at least one GOP frame for each video channel is stored at all times in the buffer.” Ex-1005, 8:29-33. In a MPEG-2 scheme, fifteen frames are maintained in the buffer: one synchronization frame (I frame) and fourteen predictive or bidirectional frames (P or B) for each received channel. *Id.*,

8:37-39. Since each of the stored GOPs have a key frame, and each GOP is stored in its own buffer, then each buffer will similarly have a first and second key frame, associated with the first and second GOPs stored in the first and second buffers, respectively. Ex-1002 ¶134.

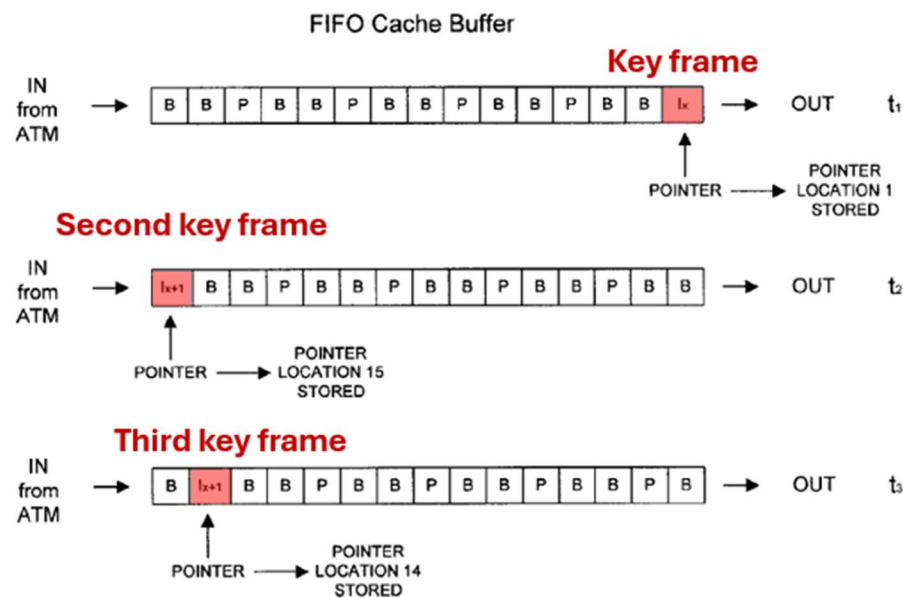


FIG. 5

Mao further teaches determining “a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames.” Specifically, Mao teaches that two or more synchronization frames per video signal can be determined and maintained. Ex-1005, 9:2-6. Mao explains that in a MPEG-2 scheme with a GOP size of fifteen, up to thirty frames can be stored. *Id.* Each I frame is separated from the next I frame “by a pre-determined number of other frames.” For example, as shown in Figure 5, the position of the first key frame pointer (I

frames) and the subsequent key frames are determined by determining that the next pointer is fourteen frames from the previous key frame pointer (I frame). Ex-1005, 8:37-39, 7:44-45; Ex-1002 ¶135.

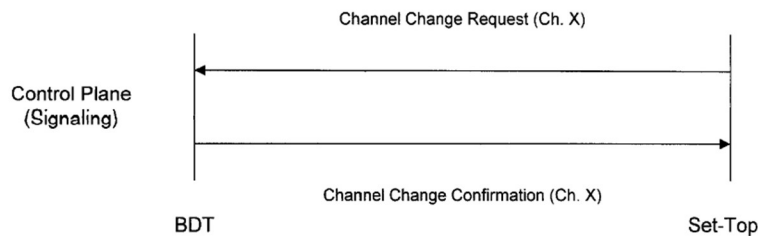
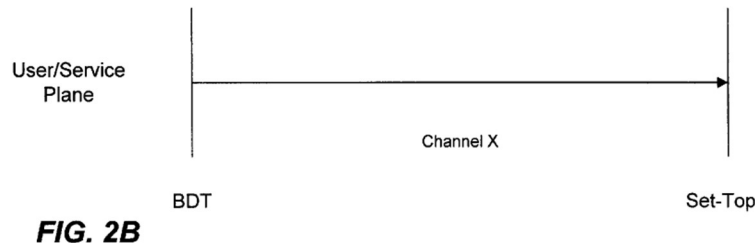
Ground 2: Mao-Liu teaches Elements 1[C] and 15[C]. Ex-1002 ¶¶136-138.

While Mao teaches that its processor determines the positions of a plurality of key frames, determines a GOP size N, and identifies Nth frames following the first key frame, Liu teaches further implementation details relating to identifying key frames as a frame that can be displayed substantially on its own and determining a GOP size N and Nth frames. Ex-1002 ¶137. For example, Liu teaches that its channel buffers 116 “may receive and buffer the latest frames for a channel up to the most recent ‘N’ I-frames.” Ex-1006, 4:46-48. Liu describes that “I-frames or ‘infraframes,’ (also known as ‘key frames’ or ‘index frames’) are independently decodable, and store all the data required to display a frame.” Ex-1006, 4:14-18. Liu further teaches that N may be as small as one, such that a single buffer stores a single GOP. Ex-1007, 8:17-21, 8:39-31. A POSITA would have been motivated, and have had a reasonable expectation of success, to implement Mao-Liu this way as explained in §XII.A.1 (motivation). Ex-1002 ¶138.

- e. **Elements 1[D]/15[D]: [receiving]/[computer code for receiving] a channel change request from a client device receiving the first media stream, the channel change request corresponding to a switch from the first media stream to the second media stream;**

Ground 1: Mao teaches elements 1[D] and 15[D]. Ex-1002 ¶¶139-141.

Mao teaches “receiving a channel change request from a client device receiving the first media stream ... to [] switch from the first media stream to the second media stream.” Mao teaches a “rapid channel changer” that receives a “subscriber’s channel change request” and assesses and directs the corresponding video signal to the subscriber. Ex-1005, Abstract. When a subscriber makes a channel change request, for example to channel X, using its set-top unit 19 (the client device), the channel change request is sent to the BDT over the broadband access system as shown in Figure 2A below. Ex-1005, 5:51-57. The subscriber’s channel change request to channel X is a channel change request corresponding to a switch from the first media steam (a channel) to the second media stream (channel X). Ex-1002 ¶140.

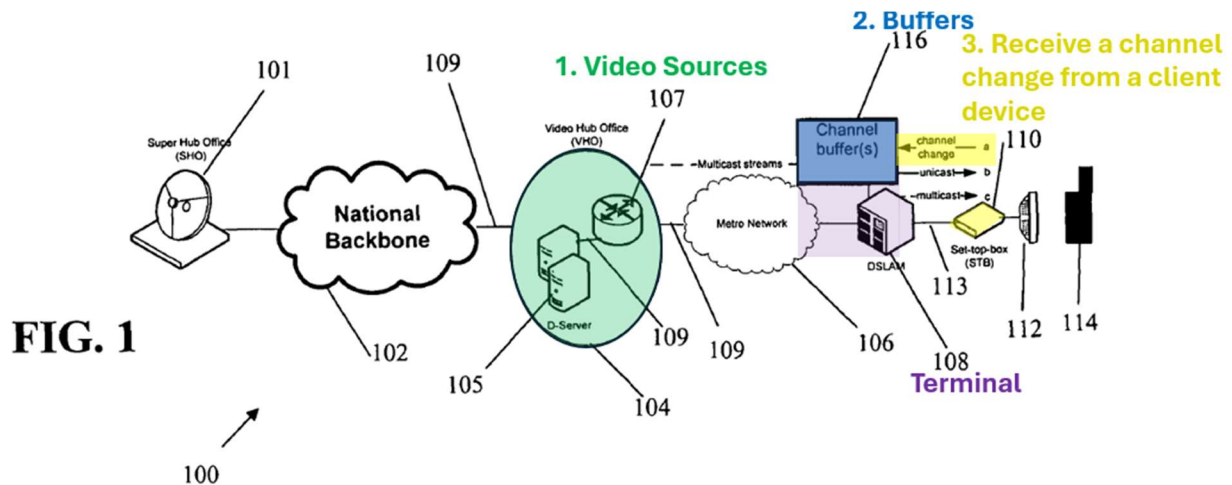


Mao further teaches the recited order of steps. As discussed in §X, Petitioner in the related litigation proposed that elements 1[A] and 1[B] must precede 1[C], and 1[C], 1[D], and 1[E] must be performed in order. Ex-1021. Mao receives media streams (elements 1[A]-1[B]/15[A]-15[B]) and then determines the positions of a plurality of key frames in the first buffer and the second buffer (elements 1[C]/15[C]) prior to receiving a channel change request (elements 1[D]/15[D]). Ex-1002 ¶141. Mao teaches receiving video streams (Ex-1005, 7:62-64, 3:38-42), and as new video information is received, previous frames are counted out so that “at least one GOP frame for each video channel is stored.” *Id.*, 8:28-33. Specifically, as one I frame leaves the buffer, a new I frame must enter the buffer. *Id.*, 7:29-30, 8:33-36. Thus, when a channel change is requested, “the requested signal can instantly be transmitted downstream to the subscriber since the processor 55 is always ‘pointing’ to an I frame for each respective channel.” *Id.*, 8:43-47. Therefore, Mao receives the video stream, identifies the I frames, and maintains the I frames in a buffer prior to receiving a channel change request. Ex-1002 ¶141.

Ground 2: Mao-Liu teaches elements 1[D] and 15[D]. Ex-1002 ¶¶142-144.

While Mao teaches receiving a channel change request from a client device to switch from the first media stream to the second media stream, Liu teaches further implementation details relating to channel changes from one channel to another. Ex-1002 ¶143. Specifically, a POSITA would have been motivated to implement Mao’s

channel change request as taught by Liu. Liu's channel buffer device 116 "may further include ... programs or instructions that detect channel changes received via a client premise equipment, such as STB 110, a processor and computer programs or instructions that provide the stored I-frame to the DSLAM in response to a customer event, such as a change of a channel." Ex-1006, 4:1-7. As shown in Figure 1, Liu explicitly teaches that the video streams are received, the I frame for each channel are identified and determined, and maintained in a buffer, before receiving a channel request. Ex-1002 ¶143.



A POSITA would have been motivated , and have had a reasonable expectation of success, to implement Mao-Liu this way as explained in §XII.A.1 (motivation). Ex-1002 ¶144.

- f. **Elements 1[E]/15[E]: [identifying]/[computer code for identifying] a next available key frame associated with the second media stream, wherein the next available**

key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel.

Ground 1: Mao teaches elements 1[E] and 15[E]. Ex-1002 ¶¶145-149.

Mao's processor "identif[ies] a next available key frame associated with the second media stream." As discussed in §X, Petitioner in the related litigation proposed that "identifying a next available key frame associated with a second media stream" means "identifying, by the streaming server, by decoding or partially decoding the frame, a next available key frame associated with the second media stream." Ex-1021, 2. Once Mao's set-top unit requests to change from the first channel (video stream) to another channel (video stream) and the BDT determines that the request is proper, the BDT then "direct[s] the corresponding video data downstream to the appropriate set top unit 19." Ex-1005, 5:55-65. BDT (the streaming server) synchronizes with "channel X as it is received from the ATM network" by decompressing and multiplexing the channel. *Id.*, 6:20-26. A POSITA would have understood that Mao's BDT's decompressing and multiplexing is "decoding or partially decoding the frame" because BDT 12 (the streaming server) receives the media stream and converts the compressed video file into a format that can be displayed on various devices. Ex-1002 ¶146.

Mao identifies the next available key frame after receiving a channel change. Specifically, the BDT receives the channel change and “***must then wait*** for the Group of Picture (GOP) start point of the requested channel.” Ex-1005, 7:8-12. The GOP start point is coded in the “I” or intracoded frames. *Id.*, 7:29-30. Thus, when “a change of channel request reaches BDT 12, the processor can immediately look up the location of the I frame from the pointer location buffer 57 and immediately access the appropriate video data.” Ex-1005, 8:52-55. The key frame associated with the second media stream is identified as the next available key frame in response to the channel change request because it is the I frame determined as the GOP starting point. Ex-1002 ¶147.

Mao provides the “next available key frame ... as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel.”⁵ As discussed in §X, a “predictive frame” is “[a] frame that relies on information from a reference key frame.” Ex-1001, 2:67-3:2. While Mao teaches that predicted frames and bidirectional frames (P and B frames) are between “I” frames, in response to the channel change request, the BDT ***waits***

⁵ As discussed in §X, Petitioner in the related litigation have proposed that this limitation is indefinite. PO has proposed that the limitations are not indefinite. *See* Ex-1022. For the purposes of this proceeding, Petitioner has applied these limitations to mean that in response to a change request, the next available key frame is provided and there are not any predictive frames transmitted at the beginning of the channel.

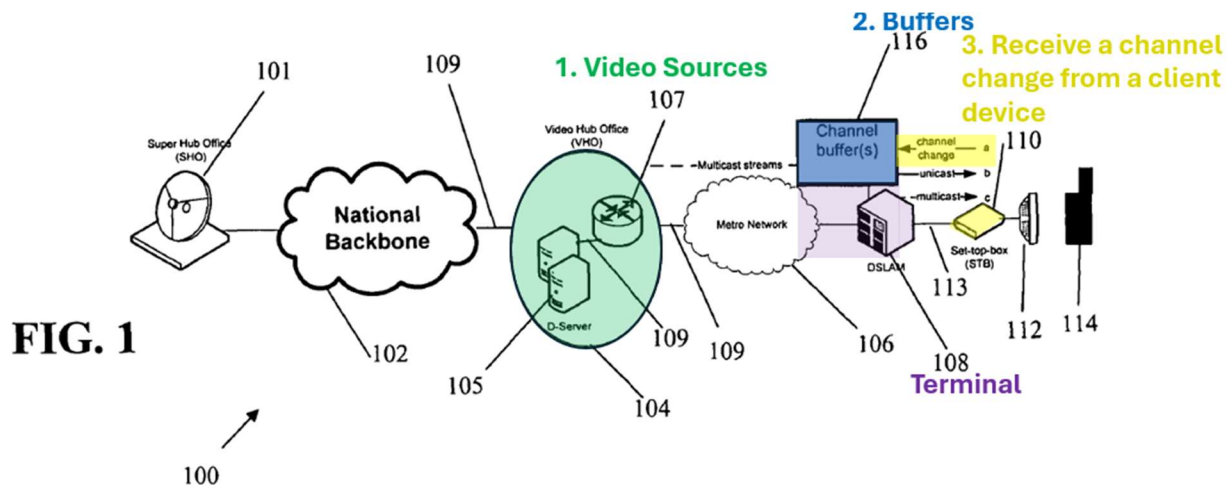
for the starting point (i.e., the next I-frame) when transmitting new channel information. Ex-1005, 7:8-12. After a channel change is requested, “the requested signal can instantly be transmitted downstream to the subscriber since the processor 55 is always ‘pointing’ to an I frame for each respective channel.” *Id.*, 8:43-47. Therefore, transmission of the requested channel begins at the start of a GOP frame, (i.e., the I frame), meaning that the transmission does not include any B or P frames before the starting I-frame is transmitted of the either the new channel or original channel. Ex-1002 ¶148.

Mao further teaches the sequential order of elements recited in elements 1[D]/15[D] and 1[E]/15[E] because BDT 12 identifies the next available key frame after receiving the channel change request. Ex-1002 ¶149. Specifically, *after a channel change is requested*, “the requested signal can instantly be transmitted downstream to the subscriber since the processor 55 is always ‘pointing’ to an I frame for each respective channel.” Ex-1005, 8:43-47.

Ground 2: Mao-Liu teaches elements 1[E] and 15[E]. Ex-1002 ¶¶150-153.

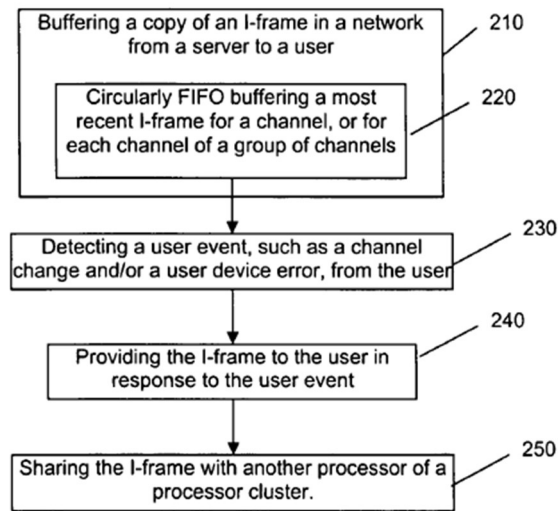
While Mao identifies a next available key frame in response to receiving a channel change request, Liu teaches further implementation details relating to identifying the key frame after receiving a channel change. As described in §XII.A.2.e (elements 1[D]/15[D]), Liu’s channel buffer device 116 (blue) includes “programs or instructions that detect channel changes received via a client premise

equipment, such as STB 110, a processor and computer programs or instructions that provide the stored I-frame to the DSLAM in response to a customer event, such as a change of a channel.” Ex-1006, 4:1-7.



As shown in Figure 2, Liu explicitly teaches that in response to a channel change request, the next available key frame is provided to the client device, before any associated P or B frames. Ex-1006, 7:24-25 (“providing 240 the I-frame to the user in response to the user event”), 9:12-23 (“The I-frame is used as a reference to predict and encode B-frames or P-frames that follow the I-frame.”); Ex-1002 ¶152.

FIG. 2



A POSITA would have been motivated, and have had a reasonable expectation of success, to implement Mao-Liu this way as explained in §XII.A.1 (motivation). Ex-1002 ¶153.

3. Dependent Claims 2, 4-7, 16, and 18-20

- a. Claims 2/16: [The method of claim 1]/[The computer readable medium of claim 15], wherein the first media stream is a first video stream and the second media stream is a second video stream.**

Grounds 1 and 2: Mao/Mao-Liu teaches Claims 2 and 16. Ex-1002 ¶¶154-155.

Mao teaches that the first and second media streams are video streams.⁶ Mao teaches “receiving video data corresponding to a plurality of video channels.” Ex-

⁶ As discussed in §X, Petitioner proposed that Claim 2 is invalid under 35 U.S.C. § 112 ¶4. PO has proposed that the plain and ordinary meaning should apply. For the

1005, 10:8-9 (Cl. 5). Specifically, BDT 12 is provided “a plurality of compressed *video signals*” from a video service provider for multiple channels. Ex-1005, 7:62-64, 3:38-42, 10:8-9 (Cl. 5). Each video channel is a video stream. Ex-1002 ¶155.

- b. Claims 4/18: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by detecting the start of a GOP.**

Grounds 1 and 2: Mao/Mao-Liu teaches Claims 4 and 18. Ex-1002 ¶¶156-157.

Mao teaches that the key frames are identified by detecting the start of a GOP. Mao teaches that “compression schemes *require a starting or synchronization frame* usually referred to as the *Group of Picture (GOP) start point*.” Ex-1005, 7:1-5. Mao “detects the *GOP start frame* (or I frame in the preferred embodiment) for each channel received and establishes a pointer for each GOP start frame.” Ex-1005, 8:22-24; Ex-1002 ¶157.

- c. Claims 5/19: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by flagging each start of a GOP as a key frame.**

Grounds 1 and 2: Mao/Mao-Liu teaches Claims 5 and 19. Ex-1002 ¶¶158-159.

purposes of this proceeding, Petitioner has applied this claim to mean that the first media stream is a first video stream and the second media stream is a second video stream because the media stream, as recited in Claim 1, includes a plurality of frames.

Mao teaches that the key frames are identified by flagging each start of a GOP as a key frame. Ex-1002 ¶159. Mao “detects the GOP start frame (or I frame in the preferred embodiment) for each channel received and establishes a pointer for each GOP start frame.” Ex-1005, 8:22-24.

- d. **Claims 6/20: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frame is an I-frame.**

Grounds 1 and 2: Mao/Mao-Liu teaches Claims 6 and 20. Ex-1002 ¶¶160-161.

Mao teaches that the key frame is an I-frame. Ex-1002 ¶161. Specifically, Mao “detects the ***GOP start frame (or I frame)*** in the preferred embodiment) for each channel received and establishes a pointer for each GOP start frame.” Ex-1005, 8:22-24.

- e. **Claim 7: The method of claim 1, wherein channel change does not occur until the second key frame can be provided to the client device.**

Grounds 1 and 2: Mao/Mao-Liu teaches Claim 7. Ex-1002 ¶¶162-164.

Mao-Liu teaches that the channel change does not occur until the second key frame can be provided to the client device. Specifically, Mao teaches that it is “desirable for the FIFO buffer to ***store two or more synchronization frames per video signal*** (i.e., each buffer stores at least thirty frames in the ... MPEG-2 embodiment).” Ex-1005, 9:2-7. Thus, when a subscriber’s channel change request

is received, the request signal can instantly be transmitted downstream to the subscriber since the processor 55 is always “pointing” to an I frame for each respective channel. Ex-1002 ¶163.

A POSITA would have understood that Mao’s storage of two synchronization frames is storing the first and second key frames before allowing the channel change to be provided to the client device because doing so was well known as taught in Liu. For example, Liu teaches that the channel buffer device 116 buffers “*the latest frames for a channel up to the most recent ‘N’ I-frames*,” where N may be as small as 1.” Ex-1006, 4:46-48. As described above, N may be 1 but it can also store two I-frames (“key frames”). If a user changes a channel, the channel’s I-frame is provided and the “DSLAM 108 retrieves an I-frame from the memory of the channel change buffer and provides that I-frame to the STB 110.” Ex-1006, 5:35-44. A POSITA would have been motivated to retrieve two I-frames before providing the channel change to Mao’s subscriber because this allows the set-top box to reconstruct a full image from the subsequently provided frames. *Id.*; Ex-1002 ¶164.

4. Independent Claim 8

a. Element 8[pre]: A system:

Grounds 1/2: Mao/Mao-Liu teaches the preamble of Claim 8, to the extent it is limiting, for the same reasons explained in §XII.A.2.a (1[pre]/15[pre]). Ex-1002

¶165. Specifically, Mao teaches an “*apparatus* for rapidly changing the channel in a digital video delivery system.” Ex-1005, 2:26-28; *see also id.*, 1:7-10.

- b. **Element 8[A]: [(i)] an interface configured to receive a first media stream including a first plurality of frames, [(ii)] a second media stream including a second plurality of frames, [(iii)] the first media stream received at a streaming server and maintained in a first buffer and [(iv)] and the second media stream received at the streaming server and maintained in a second buffer, [(v)] the streaming server configured to receive the first media stream from a media aggregation server, wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;**

Grounds 1/2: Mao/Mao-Liu teaches elements 8[A(i), A(iii), A(v)] for the same reasons explained in §XII.A.2.b (1[A]/15[A]) and elements 8[A(ii), A(iv)] for the same reasons explained in §XII.A.2.c (1[B]/15[B]). Ex-1002 ¶¶166-167. Additionally, Mao teaches “an interface configured to receive” the streams because, as shown in Figure 1, Mao’s broadband digital terminal (BDT 12) receives “a plurality of compressed video signals” from a video service provider. Ex-1005, 7:62-64, 3:38-42. Mao teaches that “BDT 12 has two OC-12c broadcast ports, which can only receive signals carrying ATM cells, and one OC-12c interactive port which can receive and transmit signals.” Ex-1005, 3:56-59. The “*interface to the ATM network-BDT interface 39* can be realized using an OC-3 or OC-12 optical interface[] carrying ATM cells.” *Id.*, 3:53-56; Ex-1002 ¶167.

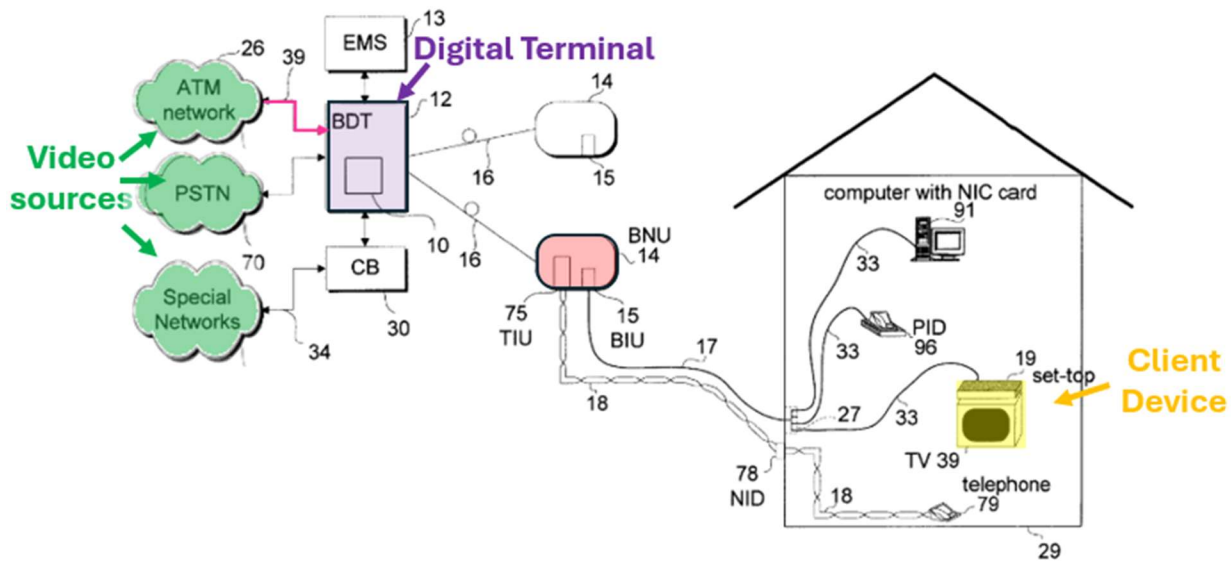


FIG. 1

- c. **Element 8[B]:** a processor configured to determine positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames;

Grounds 1/2: Mao/Mao-Liu teaches element 8[B] for the same reasons explained in §XII.A.2.d (1[C]/15[C]). Ex-1002 ¶¶168-169. Additional, Mao teaches a “processor configured to determine,” because Mao’s BDT 12 processor 55 receives the frames for each channel and *detects, establishes, and records* the GOP start frame (I frame) for each channel. Ex-1005, 8:15-26.

- d. **Element 8[C]:** wherein the processor is further configured to identify a next available key frame

associated with the second media stream, wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel change request.

Grounds 1/2: Mao/Mao-Liu teaches element 8[C] for the same reasons explained in §XII.A.2.f (1[E]/15[E]). Ex-1002 ¶170.

5. Dependent Claims 9 and 11-14

- a. Claim 9: The method of claim 8, wherein the first media stream is a first video stream and the second media stream is a second video stream.**

Grounds 1/2: Mao/Mao-Liu teaches Claim 9 for the same reasons explained in §XII.A.3.a (Claims 2 and 16). Ex-1002 ¶171.

- b. Claim 11: The method of claim 8, wherein the key frames are identified by detecting the start of a GOP.**

Grounds 1/2: Mao/Mao-Liu teaches Claim 11 for the same reasons explained in §XII.A.3.b (Claims 4 and 18) . Ex-1002 ¶172.

- c. Claim 12: The method of claim 8, wherein the key frames are identified by flagging each start of a GOP as a key frame.**

Grounds 1/2: Mao/Mao-Liu teaches Claim 12 for the same reasons explained in §XII.A.3.c (Claims 5 and 19). Ex-1002 ¶173.

- d. Claim 13: The method of claim 9, wherein the key frame is an I-frame.**

Grounds 1/2: Mao/Mao-Liu teaches Claim 13 for the same reasons explained in §XII.A.3.d (Claims 6 and 20). Ex-1002 ¶174.

- e. **Claims 14: The method of claim 8, wherein channel change does not occur until the second key frame can be provided to the client device.**

Grounds 1/2: Mao/Mao-Liu teaches Claim 14 for the same reasons explained in §XII.A.3.e (Claim 7). Ex-1002 ¶175.

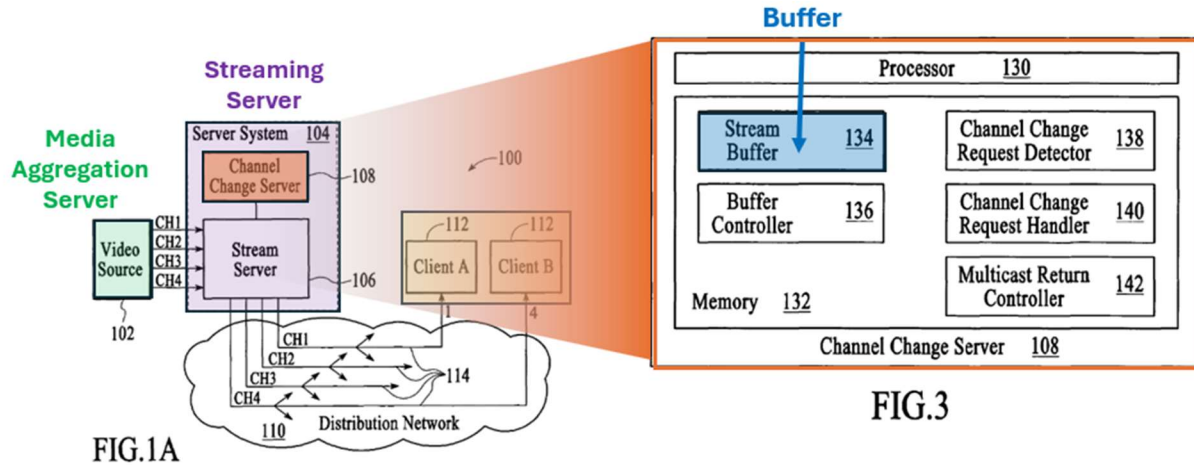
- B. **Ground 3: Claims 1, 2, 4-6, 8, 9, 11-13, 15, and 18-20 are obvious in view of Sherer in view of Wu-771.**

1. **A POSITA would have been motivated to combine Sherer’s teachings and Wu-771’s teachings and would have had a reasonable expectation of success.**

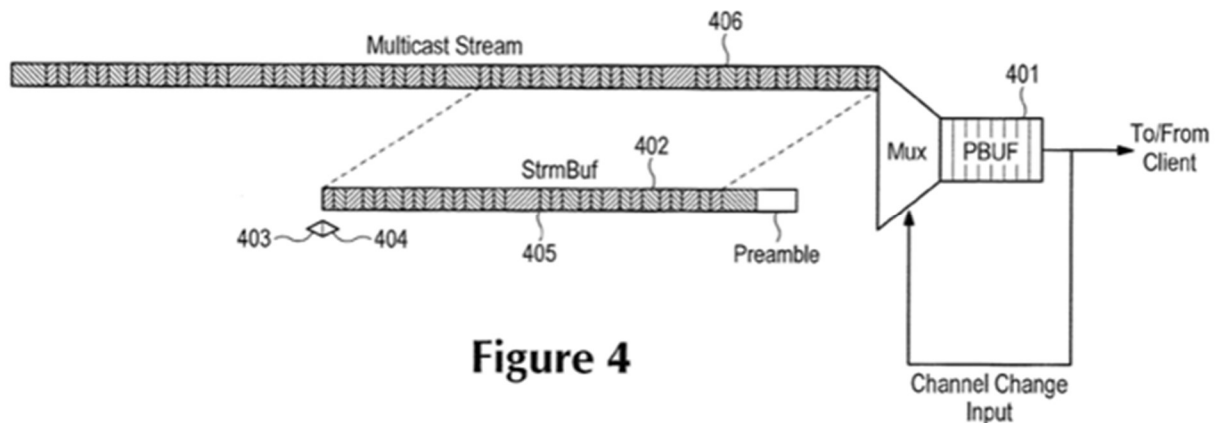
A POSITA would have been motivated to combine the teachings of Sherer and Wu-771 and had a reasonable expectation of success in doing so because each relates to providing video to a client device in response to a channel change request. Ex-1007, Title, Abstract; Ex-1008, Abstract; Ex-1002 ¶¶176-181.

Sherer teaches a “method for servicing channel change requests in a digital video network that is capable of distributing digital video content to clients.” Ex-1007, 6:35-38, 14:62-65 (Cl. 1). As shown below in Figures 1A and 3, Sherer’s server system 104 (purple) includes stream server 106 and channel change server 108 (orange), which includes processor 120, memory 143, stream buffer 134 (blue), and buffer controller 136. Ex-1007, 7:6-15. Server system 104 ingests the digital video content from the video source (green) and controls digital video content distribution. Ex-1007, 4:29-31. Stream buffer 134 “buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple

consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” *Id.*, 8:60-64.



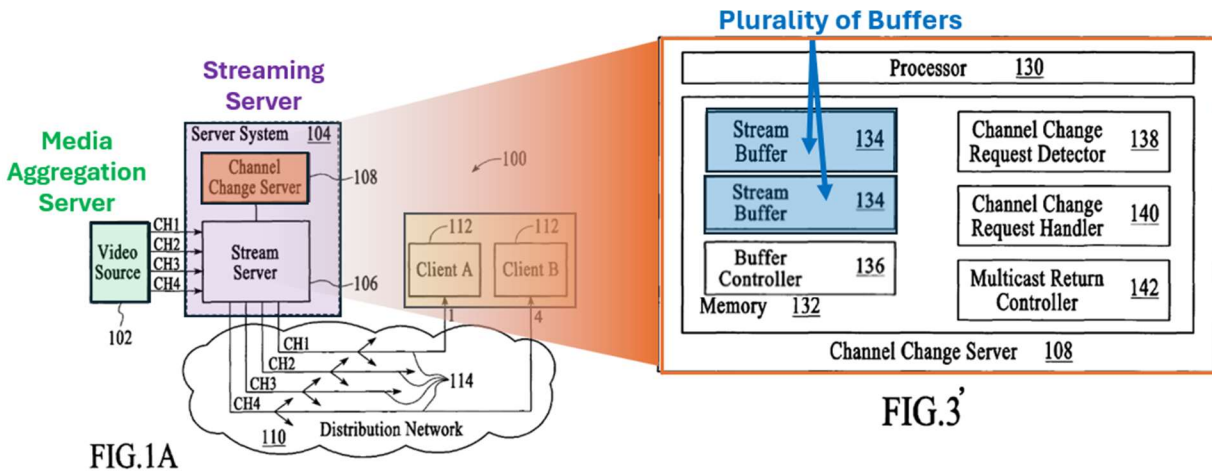
Wu-771 teaches to encode a video stream and provide encoded frames of video streams. Specifically, Wu-771 teaches that “Group of pictures is defined as the number of I, P, B frames that are sent prior to the next I frame.” Ex-1008, 3:63-64. For example, a “typical Group of Pictures (GOP) that contains I, P and B frames [are] sent” such that an I frame is followed by fourteen B and P frames. *Id.*, 3:65-4:2. “This is commonly referred to as a broadcast channel with a GOP size of 15 (i.e., 15 frames in the GOP).” *Id.*, 4:3-4. Wu-771 includes a “video acceleration module VAM,” which buffers the frames (*id.*, 4:66-67) in “fixed buffers for each multicast stream it is sourcing to clients, referred to...as Streaming Buffers (StrmBuf).” Ex-1008, 4:67-5:3. Wu-771’s StrmBuf 402 buffers “fixed number of GOP’s aligning the start of the buffer to the start of a GOP.” *Id.*, 5:3-6.



A POSITA would have been motivated to maintain Sherer’s “group of pictures (GOP) ... of *each ingested stream*,” in separate buffers at its streaming server, as taught by Wu-771. Specifically, Wu-771 teaches that its separate outgoing client buffers allow for the video to be sourced to clients faster: “the higher number of I frames sent, the faster the decoder can start displaying the picture (i.e., faster channel change time from a user perspective).” Ex-1008, 3:59-61. This would ensure that each channel’s most recent I frames are stored and can be provided to the user upon request, thus eliminating delays that would otherwise occur to fetch, identify, and further process the video stream to be provided to the user’s device and prevent distorted videos from being presented to the user. Ex-1002 ¶¶177-179.

A POSITA would have had a reasonable expectation of success in combining the teachings of Sherer and Wu-771. Ex-1002 ¶180-. Indeed, as shown below in Modified Figure 3’ below, Wu-771’s separate client buffers (blue) buffer Sherer’s GOPs for each channel. Therefore, Wu-771’s channel buffers would have been

implemented in conjunction with Sherer's architecture to carry out the same functions that Sherer is already performing, while achieving the benefits taught by Wu-771. *Id.*



Moreover, both references describe methods for receiving video data streams, identifying and storing the I-frames and predictive frames, and providing the channel requested by the user using similar hardware and software components. Ex-1007, Abstract; Ex-1008, Abstract. A POSITA would thus have understood that these references disclose interrelated teachings based on well-understood technologies that would have been amenable to various well-understood and predictable combinations. Ex-1002 ¶181.

2. Independent Claims 1 and 15

a. Element 1[pre]: A method:

Element 15[pre]: A non-transitory computer readable medium, comprising:

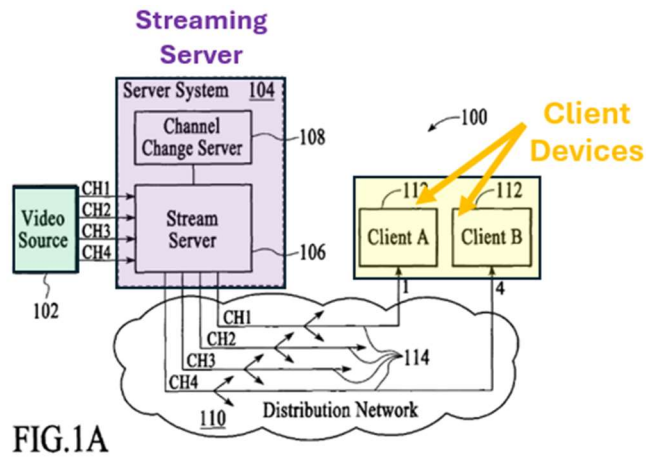
Sherer-Wu-771 teaches the preambles of Claims 1 and 15 to the extent that they are limiting. Ex-1002 ¶¶182-183. Sherer teaches a “method for servicing channel change requests in a digital video network that is capable of distributing digital video content to clients.” Ex-1007, 6:35-38, 14:62-65 (Cl. 1). Sherer also teaches “[a] processor accessible non-transitory storage media comprising processor-executable instructions.” *Id.*, 15:15-20 (Cl. 18); *see also id.*, 12:50-61. Sherer’s component functions “may be embodied as processor-executable instructions that are stored on processor-accessible memory media.” *Id.*, 12:62-13:2.

- b. Elements 1[A]/15[A]: [(i)] [receiving]/[computer code for receiving] a first media stream including a first plurality of frames, [(ii)] the first media stream received at a streaming server and maintained in a first buffer, the streaming server configured to receive the first media stream from a media aggregation server, [(iii)] wherein a plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis;**

Sherer-Wu-771 teaches elements 1[A] and 15[A]. Ex-1002 ¶¶184-191.

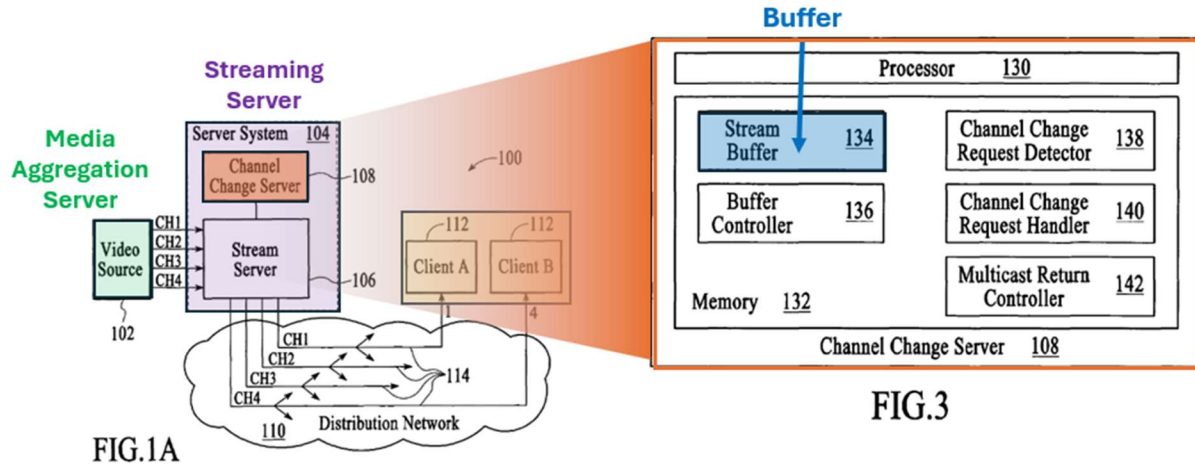
Sherer teaches “receiving a first media stream including a first plurality of frames.” For example, as shown in Figure 1A, “multiple channels of digital video content” are provided to stream server 106 (purple). Ex-1007, 4:56-57. Each channel is made of a plurality of frames because Sherer’s “stream buffer buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the

last frame before the next I-frame.” *Id.*, 8:60-64. Therefore, Sherer’s server system 104 receives a first media stream comprising a plurality of frames because stream server 104 buffers up to 1 GOP worth for each channel. Ex-1002 ¶185.



Sherer teaches that “the first media stream received at a streaming server [is] maintained in a first buffer.” Specifically, Sherer’s server system 104 ingests the digital video content for the video source and controls the distribution of the digital video content. Ex-1007, 4:29-31. As shown below in Figure 1A and Figure 3, Sherer’s server system 104 (“streaming server,” purple) includes stream server 106 channel change server 108 (orange), which includes processor 120, memory 143, stream buffer 134 (blue), and buffer controller 136. *Id.*, 7:6-15. The buffer controller manages the buffering of digital video content that is streamed into stream buffer 134. *Id.*, 7:37-38. The stream buffer “buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next

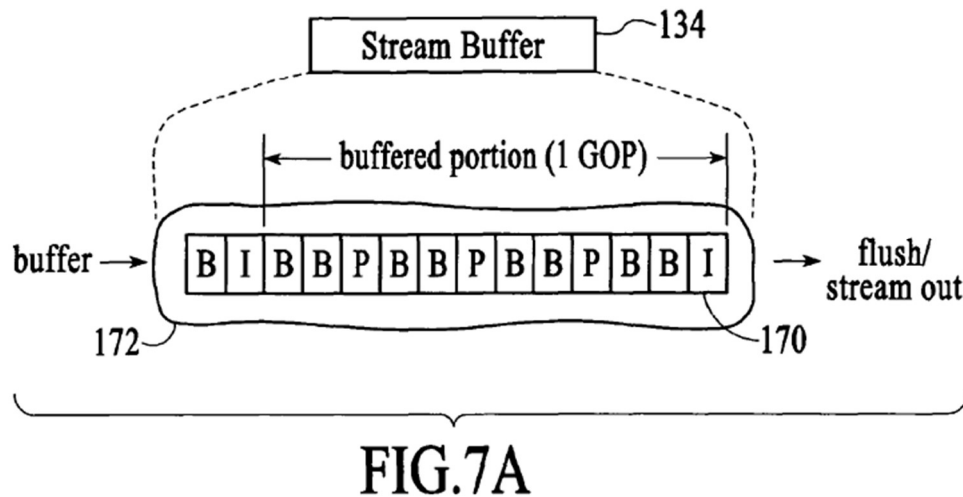
I-frame.” *Id.*, 8:60-64. Therefore, each channel’s GOP is received by the stream server and maintained in a buffer (134, blue). Ex-1002 ¶186.



In Sherer, “the streaming server [is] configured to receive the first media stream from a media aggregation server.” As discussed in §X, above, a “media aggregation server” is “any mechanism for obtaining media content from a large number of sources in order to provide the media content to mobile devices in live broadcast streams.” Ex-1001, 6:54-58. Sherer’s streaming server 104, receives “multiple channels of digital video content” from video source 102 (green). Ex-1007, 4:56-57. Sherer teaches that “the digital video content includes real-time content from the content producers and/or distributors” either live or pre-recorded. *Id.*, 4:56-5:1. As shown above in Figure 1A, video source 102 (green) is a “media aggregation server” because it is the “mechanism for obtaining media content from

a large number of sources in order to provide the media content ... in live broadcast streams” as defined in the specification. Ex-1002 ¶187; Ex-1001, 6:54-58.

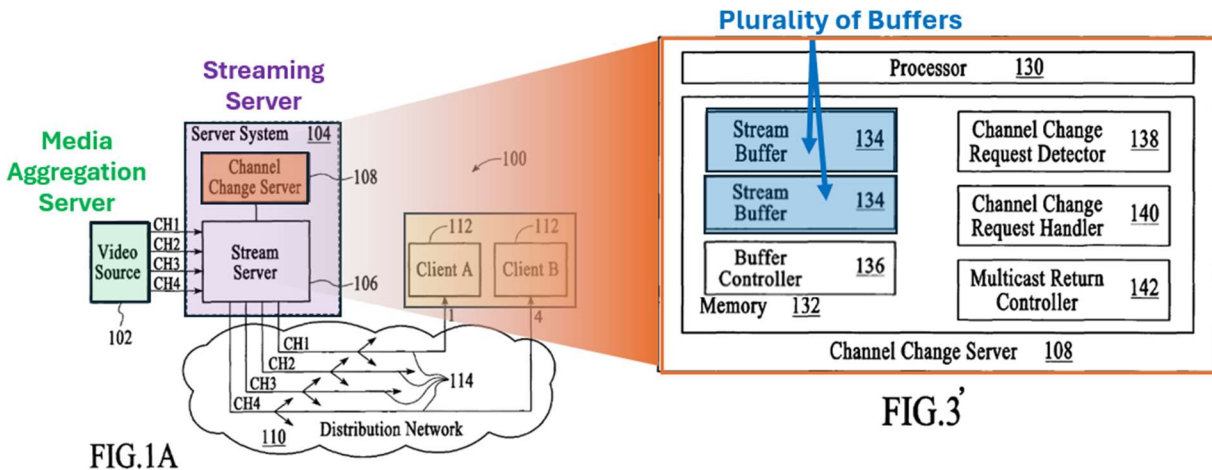
Additionally, Sherer’s “plurality of buffers at the streaming server are allocated on a per group of pictures (GOP) basis.” As discussed in §X, above, Petitioner’s proposed construction is “wherein the streaming server allocates one or more different buffers for each group of pictures (GOP).” Ex-1021, 2. “GOP” is a “sequence of different frame types, beginning with a key frame and ending just before a subsequent key frame.” Ex-1022, 2. Sherer’s stream buffer 134 “buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. For example, as shown below in Figure 7A, stream buffer 134 is allocated on a per GOP basis by allocating one buffer for each GOP received, consisting of a sequence of different frames, beginning with an I-frame and ending just before a subsequent I-frame. Ex-1002 ¶188.



While Sherer teaches implementing buffers on a per GOP basis, Wu-771 teaches further implementation details relating to allocating multiple buffers on a per GOP basis. Ex-1002 ¶189. Specifically, a POSITA would have been motivated to implement Sherer's stream buffer to include multiple buffers, as taught by Wu-771. Wu-771 teaches that its Video/Audio Acceleration Mechanism (VAM) has "as *separate outgoing client buffers* for each client port (PBUF) 401" and "*fixed buffers for each multicast stream* it is sourcing to clients, referred to herein as Streaming Buffers (StrmBuf)." Ex-1008, 4:67-5:3. Wu-771's StrmBuf buffers "fixed number of GOP's aligning the start of the buffer to the start of a GOP." *Id.*, 5:3-6.

The combined Sherer-Wu-771 system would thus have been implemented as shown in Figure 3' below. Specifically, Wu-771's separate client buffers buffer Sherer's GOPs for each channel. Therefore, Wu-771's channel buffers would have

been implemented in conjunction with Sherer's architecture to carry out the same functions that Sherer is already performing. Ex-1002 ¶190.



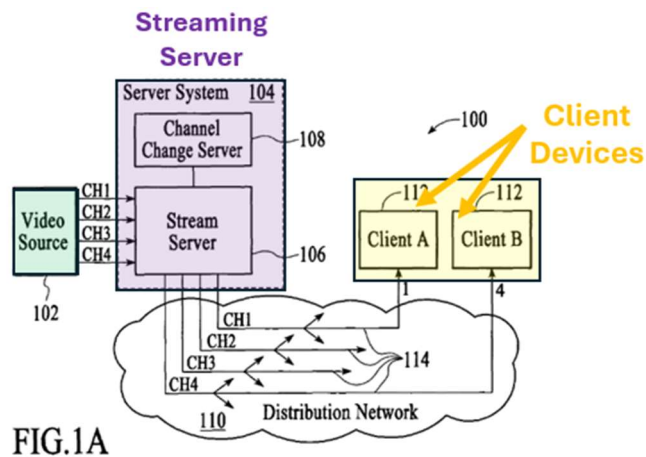
A POSITA would have been motivated, and have had a reasonable expectation of success, to implement Sherer-Wu-771 this way as explained in §XII.B.1 (motivation). Ex-1002 ¶191.

- c. **Elements 1[B]/15[B]: [receiving]/[computer code for receiving] a second media stream including a second plurality of frames, the second media stream received at the streaming server and maintained in a second buffer;**

Sherer-Wu-771 teaches elements 1[B] and 15[B]. Ex-1002 ¶¶192-195.

Sherer teaches “receiving a second media stream including a second plurality of frames.” As explained in the previous section, Sherer’s stream server 106 (purple) receives “multiple channels of digital video content.” Ex-1007, 4:56-57. Each channel is made of a plurality of frames because Sherer teaches that its “stream buffer buffers up to 1 group of pictures (GOP) worth of each ingested stream, where

a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” *Id.*, 8:60-64. Therefore, Sherer’s server system (streaming server) receives a second video stream of a plurality of frames because it receives multiple channels and buffers up to 1 GOP worth. Ex-1002 ¶193.



Sherer’s second media stream is maintained in a second buffer. Specifically, Sherer teaches that “stream buffer buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. A POSITA would have understood that the second video stream made of a plurality of frames is therefore maintained in a second buffer specific for that video channel. Ex-1002 ¶194.

While Sherer teaches implementing buffers for each video stream, Wu-771 teaches further implementation details relating to storing a second stream in a second

set of buffers. Ex-1002 ¶195. Specifically, Wu-771 teaches that its Video/Audio Acceleration Mechanism (VAM) has “as *separate outgoing client buffers* for each client port (PBUF) 401” and “*fixed buffers for each multicast stream* it is sourcing to clients, referred to herein as Streaming Buffers (StrmBuf).” Ex-1008, 4:67-5:3. Wu-771’s StrmBuf 402 buffers “fixed number of GOP's aligning the start of the buffer to the start of a GOP.” *Id.*, 5:3-6. A POSITA would have been motivated to maintain Sherer’s second video stream, including its plurality of frames, in a separate buffer, as taught by Wu-771, as explained in §XII.B.1. Ex-1002 ¶195.

- d. **Elements 1[C]/15[C]: [(i)] [determining]/[computer code for determining] positions of a plurality of key frames in the first buffer and the second buffer, the plurality of key frames including a first key frame in the first buffer and a second key frame in the second buffer, [(ii)] wherein determining positions of the plurality of key frames includes determining at the streaming server a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames;**

Sherer-Wu-771 teaches elements 1[C] and 15[C]. Ex-1002 ¶¶196-199.

Sherer determines “positions of a plurality of key frames in the first and second buffer.” Ex-1002 ¶197. As discussed in §X, “key frame” is “a frame that can be displayed substantially on its own.” Ex-1001, 2:65-67. Sherer teaches that “[a]n I-frame (MPEG2) on the other hand is a frame that presents a complete new image” and thus can be displayed substantially on its own. Ex-1007, 1:46-48; Ex-1002 ¶197

(citing Ex-1006, 4:14-18; Ex-1001, 3:3-7, 9:58-59). As shown below in Figure 5, Sherer's streaming server "ingests" the video content, block 601 (green), and "*portions of each channel* are buffered by the channel change server for use in servicing channel change requests." *Id.*, 7:56-61. Specifically, at block 602, digital video content is provided to the client and, at block 604 (blue), "*multiple consecutive frames of digital video content, including at least one I-frame are buffered.*" *Id.*, 7:59-63. Sherer's streaming server determines the plurality of I-frames for the first and second media streams because Sherer receives multiple channels and buffers "portions of each channel." Ex-1002 ¶198.

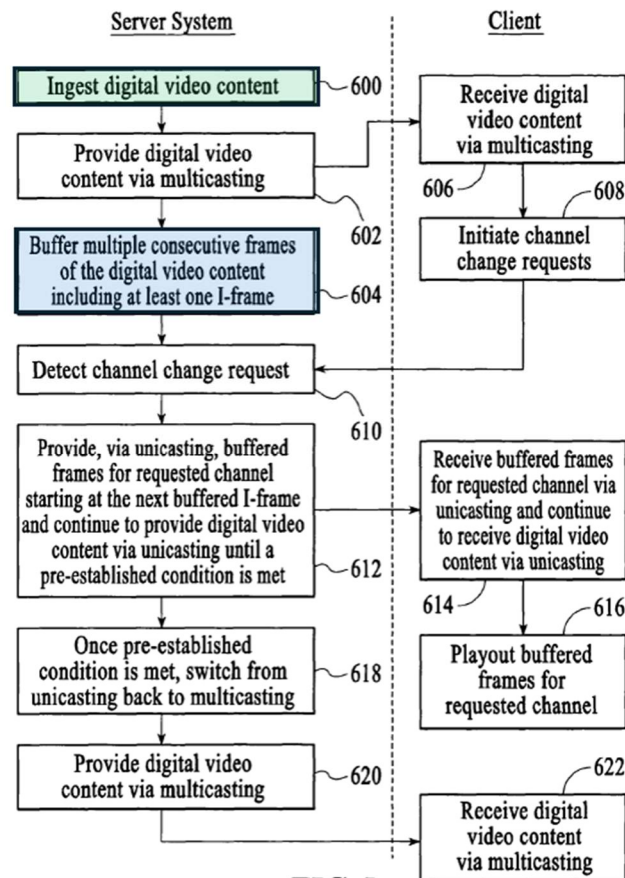
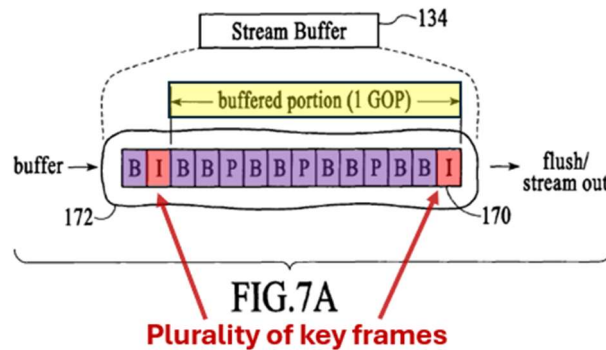


FIG.5

Sherer further teaches determining “a group of pictures (GOP) size N and identifying Nth frames following the first key frame as subsequent key frames.” Specifically, Sherer’s “stream buffer buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. For example, as shown below in Figure 7A, when determining the plurality of key frames (I-frames), Sherer determines that the GOP size is 12 (yellow) and buffers “12 frames 170 consisting of one I-frame [(red)],

three P-frames, and eight B frames [(purple)].” *Id.*, 8:64-67. Sherer thus determines the GOP size (e.g., 12) and identifies the Nth frames following the first key frame (e.g., 11 frames following the first I frame), as subsequent frames before identifying the next key frame, as the next I-frame. Ex-1002 ¶199.

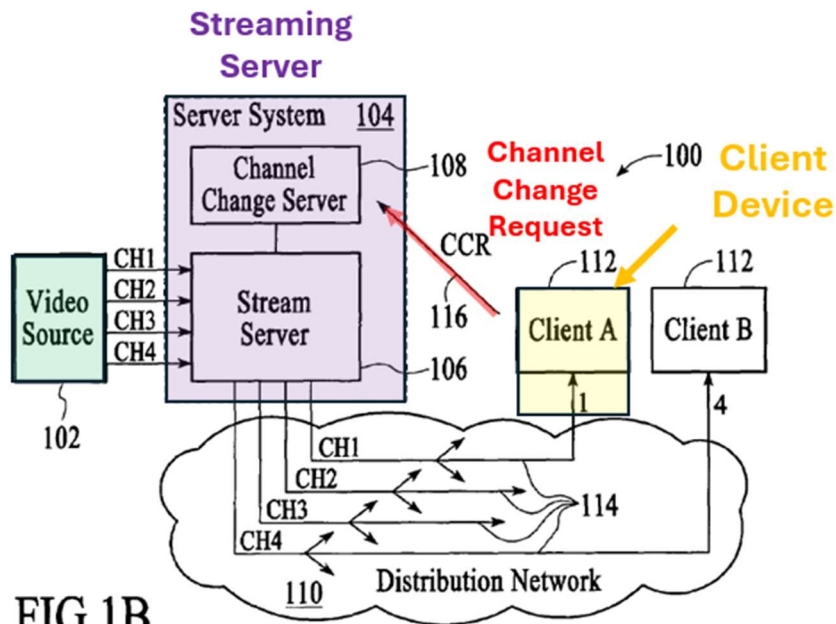


- e. **Elements 1[D]/15[D]: [receiving]/[computer code for receiving] a channel change request from a client device receiving the first media stream, the channel change request corresponding to a switch from the first media stream to the second media stream;**

Sherer-Wu-771 teaches elements 1[D] and 15[D]. Ex-1002 ¶¶200-202.

Sherer teaches “receiving a channel change request from a client device receiving the first media stream ... to [] switch from the first media stream to the second media stream.” Sherer teaches “servicing a channel change request from a client involves switching from providing the digital video content to the client via multicasting to providing the digital video content to the client via unicasting and continuing to provide digital video content to the client via unicasting until a pre-established condition is met.” Ex-1007, Abstract. As shown in Figure 1B, a “channel

change request (CCR) 116 [(red)] is made by client A [(yellow)] to change from channel 1 to channel 2.” Ex-1007, 5:22-26; Ex-1002 ¶201.



Specifically, as shown in Figure 5, the streaming server “detects” a channel change request initiated from the client device. Thus, Sherer’s server system 104 receives a channel change request from a client device receiving the first media stream of channel 1, to switch to the second media stream of channel 2. Ex-1002 ¶202.

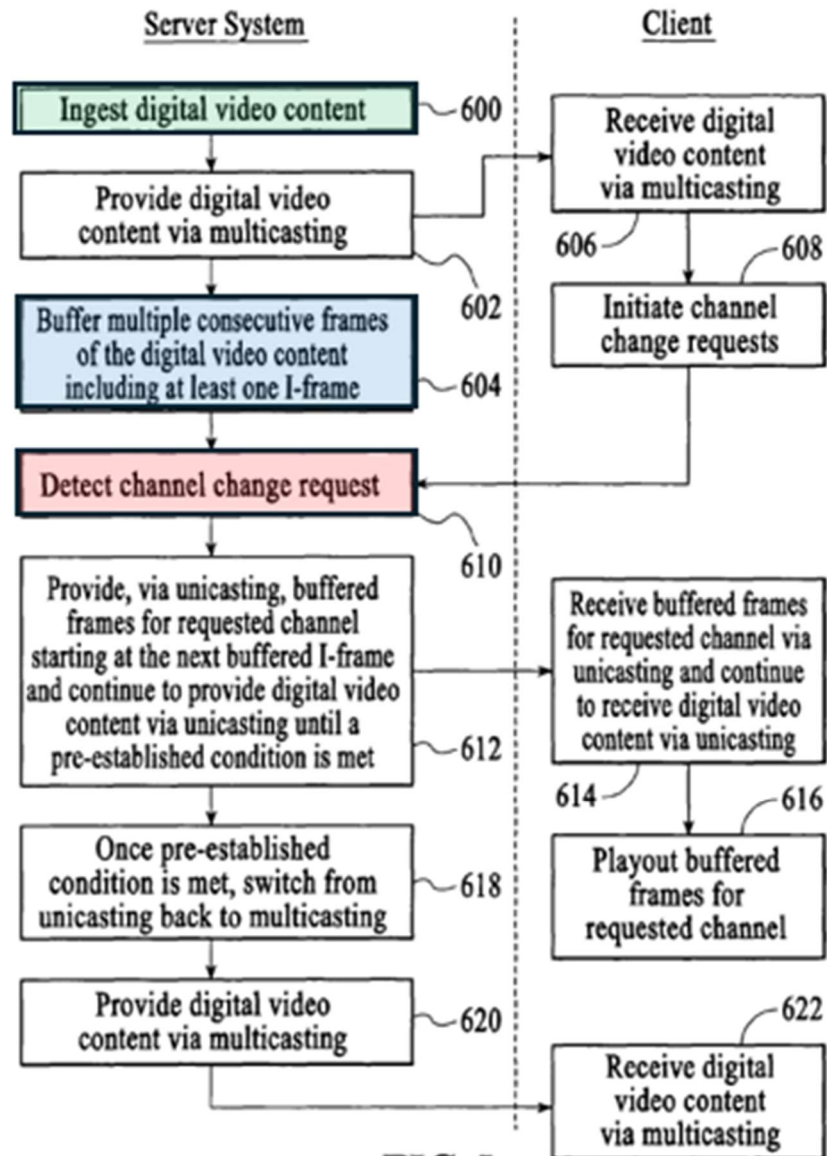


FIG.5

- f. Elements 1[E]/15[E]: [identifying]/[computer code for identifying] a next available key frame associated with the second media stream, wherein the next available key frame is provided as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel.

Sherer-Wu-771 teaches elements 1[E] and 15[E]. Ex-1002 ¶¶203-207.

Sherer “identif[ies] a next available key frame associated with the second media stream.” As discussed in §X, Petitioner in the related litigation proposed that “identifying a next available key frame associated with a second media stream” means “identifying, by the streaming server, by decoding or partially decoding the frame, a next available key frame associated with the second media stream.” As shown in Figure 5, once a channel request is initiated by the client device, block 608, and received by the channel change server in the stream server, block 610 (red), “buffered frames for the requested channel are provided to the client via unicasting,” block 612 (yellow). Ex-1007, 7:66-8:2. Specifically, Sherer teaches that “the buffered frames are provided starting at the first buffered I-frame and the digital video content continues to be provided to the client via unicasting until a pre-established condition is met.” *Id.*, 8:2-5. Sherer’s streaming server identifies a next available key frame associated with a second media stream of the requested channel by buffering the first I-frame of the requested channel. Ex-1002 ¶¶204-105. A POSITA would have understood that Sherer’s streaming server “decod[es] or partially decod[es] the frame” because the channel change server receives the media stream and converts the compressed video file into a format that can be displayed on various devices. Ex-1002 ¶205.

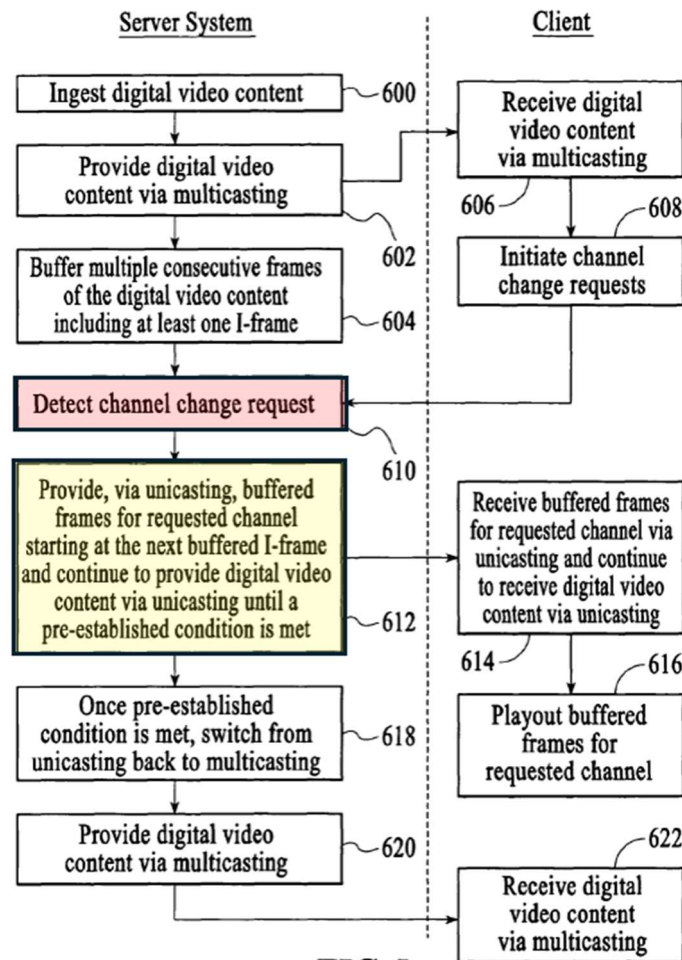


FIG.5

Sherer provides the “next available key frame ... as the second key frame in response to the channel change request, wherein no predictive frames are transmitted at the beginning of the channel.”⁷ As discussed in §X, “predictive frame” is “a frame that relies on information from a reference key frame.” Ex-1001, 2:67-3:2. In

⁷ As discussed in §X, Petitioner in the related litigation proposed that this limitation is indefinite. For the purposes of this proceeding, Petitioner has applied these limitations to mean that in response to a change request, the next available key frame is provided and there are not any predictive frames transmitted at the beginning of the channel.

response to the channel change request, Sherer's streaming server provides the second stream "***starting at the first buffered I-frame*** and the digital video content continues to be provided to the client." Ex-1007, 8:2-5. Sherer, as shown below in Figure 7B, the channel change request "begins with the first buffered I-frame and continues with the frames 170 (including B, P, and I frames) that consecutively follow the first I-frame." *Id.*, 9:23-26. For example, Sherer's streaming server indicates the channel change boundary by "using a marker bit or an explicit signal ***at the first I-frame of a new unicast stream***" such that "once the client detects the start of the new unicast stream, the client ***resets its decoder and flushes from its buffer undecoded frames related to the previous unicast stream.***" *Id.*, 6:18-24. Therefore, at the beginning of the channel the starting GOP frame, I frame, of the second media stream is the only frame transmitted in response to the channel change because the frames related to the previous channel are "flushed" from the buffer and not transmitted. Ex-1002 ¶206.

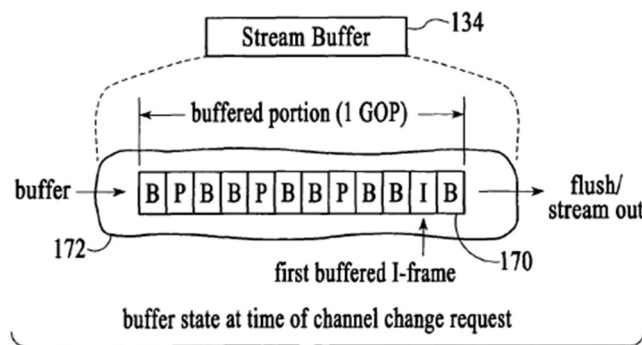


FIG.7B

Sherer teaches the recited order. As discussed in §X, Petitioner in the related litigation proposed that elements 1[A] and 1[B] must precede 1[C], and 1[C], 1[D], and 1[E] must be performed in order. Ex-1021. As shown in Figure 5, Sherer receives media streams (1[A]-1[B]/15[A]-15[B], green) and determines the positions of a plurality of key frames in the first buffer and the second buffer (1[C]/15[C], blue) prior to receiving a channel change request (1[D]/15[D], red). Ex-1002 ¶107. Upon receiving the channel change request, Sherer's streaming server identifies and buffers the next available key frame for the requested second media stream (1[E]/15[E], yellow). *Id.*

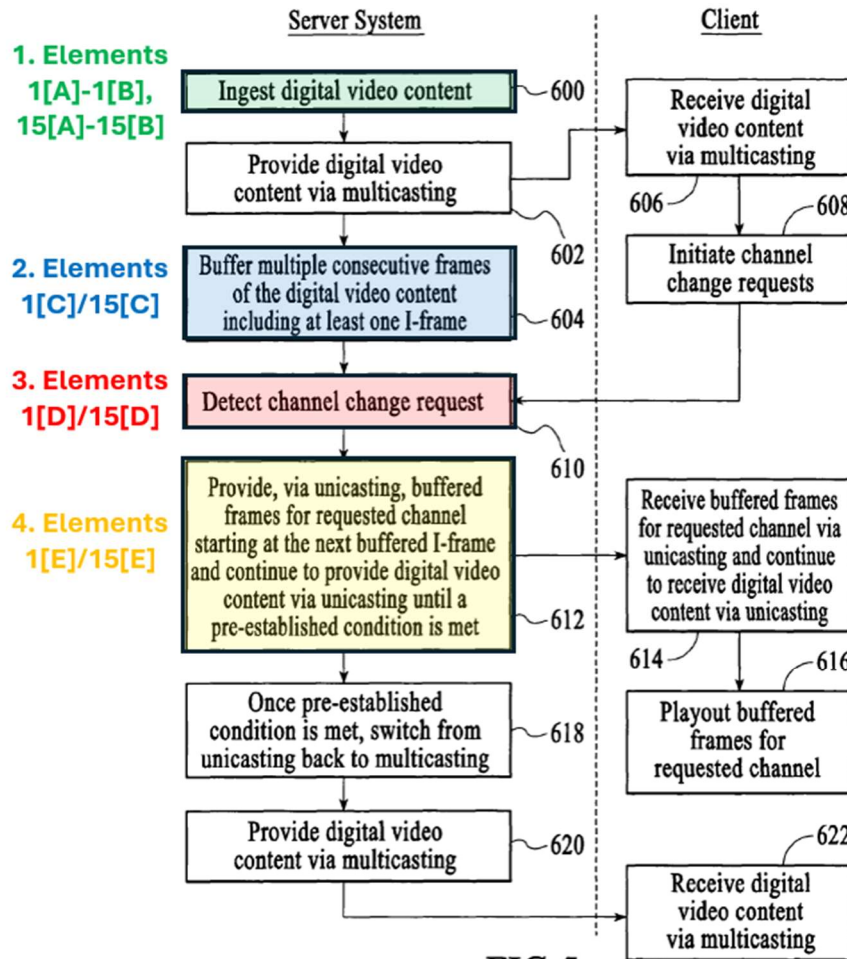


FIG.5

3. Dependent Claims 2, 4-6, 16, and 18-20

- a. **Claims 2/16:** [The method of claim 1]/[The computer readable medium of claim 15], wherein the first media stream is a first video stream and the second media stream is a second video stream.

Sherer-Wu-771 teaches Claims 2 and 16. Ex-1002 ¶¶208-209.

Sherer teaches that the first and second media streams are video streams.⁸ Specifically, Sherer’s streaming server 104 receives “multiple channels of *digital video content*” from video source 102, either live or pre-recorded. Ex-1007, 4:56-5:1; Ex-1002 ¶209.

b. Claims 4/18: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by detecting the start of a GOP.

Sherer-Wu-771 teaches Claims 4 and 18. Ex-1002 ¶¶210-211.

Sherer teaches that the key frames are identified by detecting the start of a GOP. Sherer’s “stream buffer buffers up to 1 group of pictures (GOP) worth of each ingested stream, where a GOP is defined as a series of multiple consecutive frames beginning with an I-frame and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. Sherer detects the key frames as the start of the GOP because Sherer’s streaming server identifies and buffers a GOP “beginning with an I-frame.” Ex-1002 ¶211.

⁸ As discussed in §X, Petitioner proposed that Claim 2 is invalid under 35 U.S.C. § 112 ¶4. PO has proposed that the plain and ordinary meaning should apply. For the purposes of this proceeding, Petitioner has applied this claim to mean that the first media stream is a first video stream and the second media stream is a second video stream because the media stream, as recited in Claim 1, includes a plurality of frames.

- c. **Claims 5/19: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frames are identified by flagging each start of a GOP as a key frame.**

Sherer-Wu-771 teaches Claims 5 and 19. Ex-1002 ¶¶212-213.

Sherer teaches that the key frames are identified by flagging each start of a GOP as a key frame. Sherer buffers up to one GOP worth of stream “where a GOP is defined as a series of multiple consecutive frames *beginning with an I-frame* and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. For example, Sherer’s streaming server “us[es] a marker bit or an explicit *signal at the first I-frame* of a new unicast stream.” *Id.*, 6:18-24; Ex-1002 ¶213.

- d. **Claims 6/20: [The method of claim 1]/[The computer readable medium of claim 15], wherein the key frame is an I-frame.**

Sherer-Wu-771 teaches Claims 6 and 20. Ex-1002 ¶¶214-215.

Sherer teaches that the key frame is an I-frame. Sherer buffers up to one GOP worth of stream “where a GOP is defined as a series of multiple consecutive frames *beginning with an I-frame* and continuing until the last frame before the next I-frame.” Ex-1007, 8:60-64. “An I-frame (MPEG2) ... is a frame that presents a complete new image.” Ex-1007, 1:46-48; Ex-1002 ¶215.

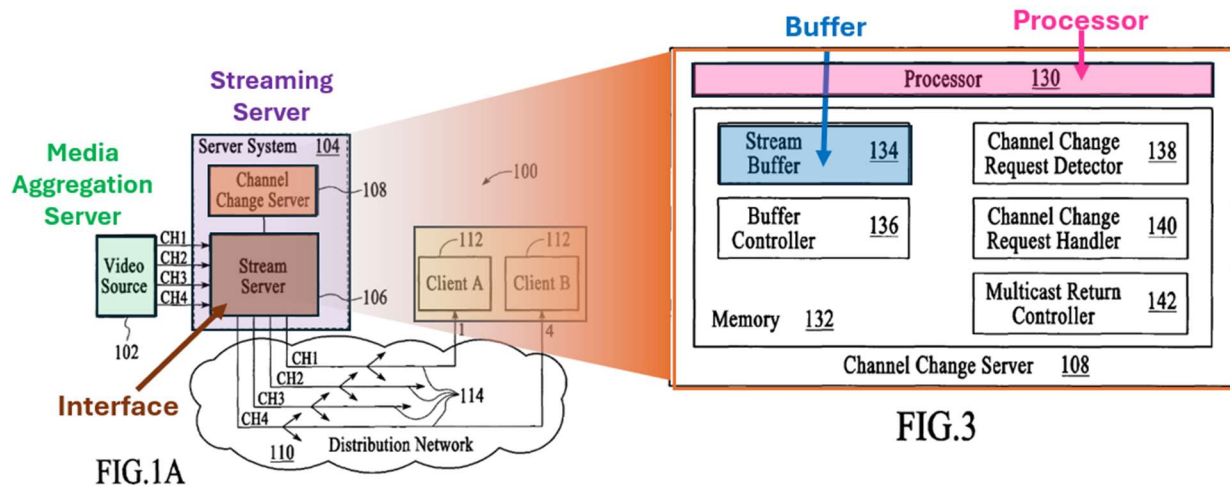
4. Independent Claim 8

a. Element 8[pre]

Sherer-Wu-771 teaches the preamble of claim 8, to the extent it is limiting, for the same reasons explained in §XII.A.2.a (1[pre]/15[pre]). Ex-1002 ¶216. Sherer teaches a “**system** for servicing channel change requests in a digital video network that is capable of distributing digital video content to clients.” Ex-1007, 16:12-15 (Cl. 20).

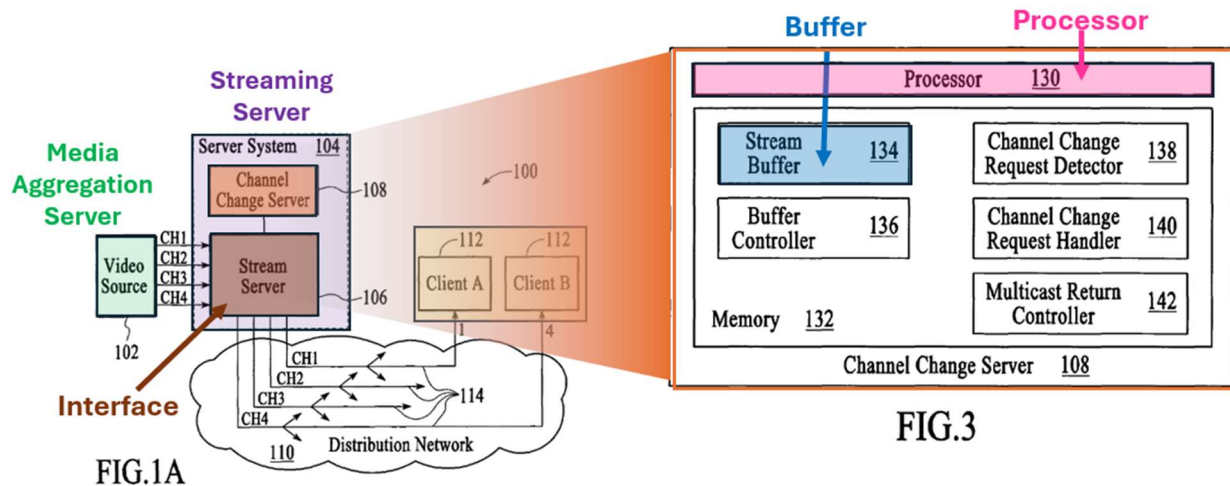
b. Element 8[A]

Sherer-Wu-771 teaches elements 8[A(i), A(iii), A(v)] for the same reasons explained in §XII.B.2.b (1[A]/15[A]) and elements 8[A(ii), A(iv)] for the same reasons explained in §XII.B.2.c (1[B]/15[B]). Ex-1002 ¶¶217-218. Additionally, Sherer teaches an “interface to receive.” As shown below in Figure 1A and Figure 3, Sherer’s server system 104 (“streaming server,” purple) includes stream server 106 (brown), channel change server 108 (orange), which includes processor 120 (pink), memory 143, stream buffer 134 (blue), and buffer controller 136. Ex-1007, 7:6-15. Stream server 106 (brown) is the interface configured to receive the media streams because it “ingests the digital video content from the video source and controls the distribution of the digital video content into the distribution network.” *Id.*, 4:29-31.



c. Element 8[B]

Sherer-Wu-771 teaches element 8[B] for the same reasons explained in §XII.B.2.d (1[C]/15[C]). Ex-1002 ¶¶219-220. Additionally, Sherer teaches a “processor configured to determine.” As shown below in Figure 1A and Figure 3, Sherer’s server system 104 (“streaming server,” purple) includes stream server 106 (brown), channel change server 108 (orange), which includes processor 120 (pink), memory 143, stream buffer 134 (blue), and buffer controller 136. Ex-1007, 7:6-15. The buffer controller manages the buffering of digital video content that is streamed into the stream buffer. *Id.*, 7:37-38. Sherer teaches that “buffer controller 136, channel change request detector 138, channel change request handler 140, and multicast return controller 142 *may be embodied as processor-executable instructions that are stored on processor-accessible memory media.*” *Id.*, 12:62-65. Therefore, the processor determines positions of a plurality of key frames in the first buffer and the second buffer. Ex-1002 ¶220.



d. Element 8[C]

Sherer-Wu-771 teaches element 8[C] for the same reasons explained in §XII.B.2.f (1[E]/15[E]). Ex-1002 ¶221.

5. Dependent Claims 9 and 11-13

a. Claim 9

Sherer-Wu-771 teaches Claim 9 for the same reasons explained in §XII.B.3.a (Claims 2 and 16). Ex-1002 ¶222.

b. Claim 11

Sherer-Wu-771 teaches Claim 11 for the same reasons explained in §XII.B.3.b (Claims 4 and 18) . Ex-1002 ¶223.

c. Claim 12

Sherer-Wu-771 teaches Claim 12 for the same reasons explained in §XII.B.3.c (Claims 5 and 19). Ex-1002 ¶224.

d. Claim 13

Sherer-Wu-771 teaches Claim 13 for the same reasons explained in §XII.B.3.d (Claims 6 and 20). Ex-1002 ¶225.

XIII. CONCLUSION

Petitioner requests institution of IPR for Claims 1, 2, 4-9, 11-16, and 18-20 of the '705 Patent based on each of the grounds in this Petition.

Respectfully Submitted,

/s/ Benjamin M. Haber

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CERTIFICATE OF WORD COUNT

Pursuant to 37 C.F.R. §42.24(d), Petitioner certifies that this petition includes 13,858 words, as measured by Microsoft Word, exclusive of the table of contents, mandatory notices under §42.8, certificates of service, word count, and exhibits.

CERTIFICATE OF SERVICE (37 C.F.R. §42.6(e)(1))

The undersigned hereby certifies that the above document was served on November 5, 2025, by filing this document through the Patent Trial and Appeal Board P-TACTS System, as well as delivering a copy via express mail upon the following attorneys of record for the Patent Owner:

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