

Filed: September 5, 2024

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.
Petitioner,

v.

Scale Video Coding LLC,
Patent Owner.

IPR2024-01371
U.S. Patent No. 11,019,372

**PETITION FOR *INTER PARTES* REVIEW OF
U.S. PATENT NO. 11,019,372**

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EXHIBIT LIST

No.	Exhibit Description
1001	U.S. Patent No. 11,019,372 (“the 372 Patent”)
1002	File History of U.S. Patent No. 11,019,372
1003	Declaration of Dr. Sandeep Chatterjee
1004	CV of Dr. Sandeep Chatterjee
1005	U.S. Patent 7,093,028 (“ <u>Shao-028</u> ”)
1006	U.S. Pub No. 2001/0047423 (“ <u>Shao-423</u> ”)
1007	Preliminary Infringement Contentions (“PIC”)
1008	RFC2507 entitled “IP Header Compression” (published February 1999)
1009	U.S. Pub No. 2004/0125797 (“ <u>Raisanen</u> ”)
1010	Patent Owner’s Reply Claim Construction Brief
1011	U.S. Patent No. 7,478,139 (“ <u>Garafolo</u> ”)
1012	RFC2460 entitled “Internet Protocol, Version 6 (IPv6) Specification” (published December 1998)
1013	<i>Video Multicast over the Internet</i> , Li, Xue et al., IEEE NETWORK, VOL. 13, NO. 2 (published 1999)
1014	Prov. App. 60/647,601
1015	“H.264 and MPEG-4 Video Compression, Video Coding for Next-generation Multimedia,” Iain E. G. Richardson, John Wiley & Sons Ltd. (published 2003)
1016	“Multimedia Communications, Directions and Innovations,” Jerry D. Gibson, Academic Press (published 2001)
1017	“TCP/IP Network Administration,” Craig Hunt, 3 rd edition, O’Reilly (published 2002)
1018	Excerpts from “Microsoft Computer Dictionary,” 5 th edition, Microsoft Press (published 2002)
1019	“Overview of the Scalable Video Coding Extension of the H.264/AVC Standard,” H. Schwarz et al, IEEE TRANSACTIONS

	ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 17, NO. 9, SEPTEMBER 2007
1020	Declaration of Mr. Michael Adams in support of Patent Owner's Reply Claim Construction Brief
1021	U.S. Pub. No 2005/0141610 ("Isu")
1022	ISO/IEC 14496-2 International Standard, Information technology — Coding of audio-visual objects — Part 2: Visual (published June 2004)

TABLE OF ABBREVIATIONS AND CONVENTIONS

Abbreviation	Meaning
372 Patent	Ex.1001: U.S. Patent No. 11,019,372
IPR	<i>inter partes</i> review
IPv6	Internet Protocol version 6
Petitioner	Cisco Systems, Inc. (“Cisco”)
Patent Owner or PO	Scale Video Coding, Inc. (“SVC”)
Preliminary Infringement Contentions	PIC: Ex.1007
<i>xx.yy–zz</i>	column <i>xx</i> , lines <i>yy</i> to <i>zz</i>

I. INTRODUCTION

Petitioner submits this Petition for *Inter Partes* Review of claims 1-3, 5-8, 10-13, and 15 (the “Challenged Claims”) of U.S. Patent No. 11,019,372 (the “372 Patent” (Ex.1001)), assigned to Patent Owner (“PO”). Petitioner respectfully submits that the Challenged Claims of the 372 Patent are unpatentable under 35 U.S.C. §103 in view of the prior art references discussed herein. Accordingly, it is respectfully requested that the Board institute an *inter partes* review of the 372 Patent.

II. MANDATORY NOTICES

A. Real Party-in-Interest

The real party-in-interest for this Petition is Cisco Systems, Inc.

B. Related Matters

The 372 Patent is asserted by PO in *Scale Video Coding LLC v. Cisco Systems, Inc.*, 4-23-cv-00803 (EDTX).

C. Lead and Back-Up Counsel and Service Information

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Petitioner consents to electronic service by email at WS-Cisco-ScaleVideoCoding@winston.com and the e-mail addresses listed above.

III. PAYMENT OF FEES

Petitioner authorizes the Office to charge the filing fee and any other necessary fee to Deposit Account No. 501814.

IV. REQUIREMENTS FOR *INTER PARTES* REVIEW

A. Grounds for Standing

Petitioner certifies that the 372 Patent is available for *inter partes* review. Petitioner is not barred or estopped from requesting an *inter partes* review challenging the claims on the identified grounds herein. Petitioner has not filed a civil action challenging the validity of a claim of the 372 Patent. This petition is being filed no more than 1 year after the date on which Petitioner was served with a complaint alleging infringement of the 372 Patent.

B. Identification of Challenged Claims

Ground 1: Claims 1-3, 5-8, 10-13, and 15 are unpatentable as obvious under 35 U.S.C. § 103 based on Shao-028 (Ex.1005).

Ground 2: Claims 1-3, 5-8, 10-13, and 15 are unpatentable as obvious under 35 U.S.C. § 103 based on Shao-028 in view of Shao-423 (Ex.1006).

V. THE 372 PATENT

A. Effective Filing Date

Petitioner assumes for the purposes of this Petition that **January 26, 2005**, is the effective filing date.

B. Person of Ordinary Skill in the Art

A Person of Ordinary Skill in The Art (“POSITA”) in January 2005 would have had a working knowledge of the telecommunications and networking art that is pertinent to the 372 Patent. A POSITA would have had a bachelor’s degree in electrical engineering, computer science, computer engineering, or an equivalent, and two years of relevant experience in telecommunications, networking, and video encoding, decoding, and routing. Lack of professional experience can be remedied by additional education, and vice versa. Ex.1003, ¶22.

C. Overview of the 372 Patent

The 372 Patent issued from U.S. Patent Appl. No. 15/010,573 filed on January 26, 2016, and claims priority to Prov. App. 60/647,601 (filed January 26, 2005) and U.S. Pat. Nos. 9,414,094 (filed September 14, 2012), 8,514,718 (filed June 17, 2009), and 7,733,868 (filed January 26, 2006). Ex.1001, 1:5-16.

The 372 Patent is generally related to a network management system that purportedly handles packet loss and network congestion problems in multicast networks. Ex.1001, Abstract. In the purported invention of the 372 Patent, “the overlay network includes a number of software implemented routers connected by normal IP or TCP connections.” Ex.1001, 3:27-41. Because routers “use the packet priority numbers when making forwarding selections on congested parts of the network, a source carefully divides its data packets over different layers or priorities, in a way that a subset of the layers still contain a useful, uncorrupted representation of the data.” Ex.1001, 21:53-61. Thus, “[w]hen an outgoing link of a router has insufficient bandwidth to transmit all pending packets, it forwards only those packets with a designated priority or the highest priority.” Ex.1001, 21:38-47. As a result, receivers that are on congested parts of the network will then receive the highest priority parts of the data only. The 372 Patent explains the purported benefit of this approach is that “it eliminates the need to lower the publishing rate to match the slowest receiver, while still being able to offer live, uncorrupted, thinned data streams to clients suffering from insufficient bandwidth.” Ex.1001, 21:61-66.

VI. CLAIM CONSTRUCTION

Claims are given their “ordinary and customary meaning” as understood by a POSITA and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). Because a POSITA would find the challenged claims unpatentable under any

interpretation consistent with their plain and ordinary meaning in the context of the 372 Patent, the Board need not expressly construe the claim terms. *See Vivid Techs., Inc. v. Am. Sci. & Eng. 'g. Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999). Petitioner also notes that the Patent Owner has asserted in the district court that no terms require construction. Ex.1010, 11.

VII. PRINCIPAL PRIOR ART

A. Summary of Shao-028

U.S. Patent 7,093,028 (“Shao-028”) is generally directed to a scalable video transmission scheme for selectively transmitting video data based on the type of information included in the video data in response to dynamically changing network conditions and/or client preferences. Ex.1005, 1:8-12. Shao-028 recognizes that video objects typically include “different types of video object information, such as, *e.g.*, control information, shape information, motion information and texture information,” based upon which, Shao-028 associates a “transmission priority level” to the information. Ex.1005, 2:44-29, 8:30-33.

Shao-028 discloses a video transmission agent (VTA), *e.g.*, implemented as a component of a router that “receive[s] video data bitstreams, filter[s] the received data bitstream by selectively discarding data packets having lower priorities, and send[s] the resulting filtered data bitstream to a client 13 and/or a next (downstream) VTA 84.” Ex.1005, 13:24-26, 13:10-15. Shao-028 explains that the video data

bitstreams comprise media objects encoded “using I, P, B, and enhancement frame layers.” Ex.1005, 5:6-10. “VTAs will filter out data packets from upstream according to downstream requirements (e.g., according to the network link and a particular clients capabilities). For example, data packets containing texture information for a particular video object may be dropped by the VTA.” Ex.1005, 10:26-30. Should the network become congested, as recognized by a router implementing a VTA, “data packets having lower priority levels are selectively dropped.” Ex.1005, 3:11-16, 9:12-27, 8:57-60. Shao-028 explains the benefit of implementing VTAs by contrasting the filtering functionality of VTAs with a “traditional video filter.” A traditional video filter “needs to implement decoding and re-encoding to complete the filtering. [H]owever, the VTAs can implement the filtering by only discarding some less important packets in a much simpler and faster fashion than traditional filters.” Ex.1005, 13:62-67. Shao-028 teaches an implementation using “MPEG-4 video encoding/decoding source code and Ipv6 protocol stack source codes.” Ex.1005, 14:1-5.

B. Summary of Shao-423

U.S. Pub No. 2001/0047423 (“Shao-423”), a reference by the same inventor as Shao-028, generally relates to “scalable ... multimedia communication techniques within a heterogeneous network and user environment.” Ex.1006, [0016]. Analogous to the teachings in Shao-028, Shao-423 recognizes that “[d]ifferent types

of information within a compressed bitstream can have different importance levels” and an encoder implementing layered coding can “output one base layer and several enhancement layers.” The information of the base layer, which has the highest transmission priority, is much more important than that of the enhancement layers. Ex.1006, [0105]-[0106].

Shao-423 teaches a “general transport framework architecture ... suitable for use by ... multimedia applications ... using MPEG-4” and further provides “an IPv6 header ... as an example to explain how to define such an identifier.” Ex.1006, [0102]. Specifically, Shao-423’s exemplary IPv6 header includes a “flow label field” (comprising a “*layer identifier*”) and used as an “Application-Flow-Layer Identifier. According to Shao-423, this Application-Flow-Layer Identifier can be used by [application-aware resource controllers] ARCs and [media processing agents] MPAs,” which are network components providing similar functionality as routers. Ex.1006, [0050], [0053], *see also* [0102]-[0103]. Shao-423’s methods provide improved multimedia communications, *e.g.*, by achieving optimal playback quality of a video bitstream under resource and cost constraints. Ex.1006, [0010], [0108].

VIII. THE CHALLENGED CLAIMS ARE UNPATENTABLE

A. Ground 1: Shao-028 renders obvious claims 1-3, 5-8, 10-13, and 15

1. Independent Claims 1, 6, and 11: Preamble

- a. [1.0] A video router, comprising:
- b. [6.0] A method for transmitting video signals, the method comprising:
- c. [11.0] A scalable video coding router, comprising:

While the term “router” is described in numerous passages, the terms “*video router*”/“*scalable video coding router*” are not described in the specification of the 372 Patent—those terms only appear in the claims. *E.g.*, Ex.1001, 35:15-37-11. However, the 372 Patent does explain that the disclosed system can be used in “audio and video codecs that divide live multimedia content over layers to enhance the user experience over wide area networks” and supports “any data type, including audio/video data and financial data.” Ex.1001, 21:66-22:2, 21:45-47. Ex.1003, ¶73.

A router¹ implementing a “video transmission agent (VTA)” is a network node identified in Shao-028 that corresponds to the “*video router*”/“*scalable video coding router*” claimed in the 372 Patent. In particular, Shao-028 discloses implementing a VTA “as a component of the router or gateway, a server or part of a server

¹ For ease of reference, a router implementing a “video transmission agent (VTA)” in Shao-028 is termed herein as a “VTA Router.”

attaching to the router²” and further discloses each VTA “**using [a] scalable** transmission scheme.” Ex.1005, 13:24-26, 13:58-62. Therefore, the “VTA Router” of Shao-028 discloses both a “*video router*” and “*scalable video coding router*”³. Ex.1003, ¶74.

In addition, a VTA Router in Shao-028 is a “*scalable video coding router*” because the VTA Router handles processing of MPEG-4 video bitstreams (see Ex.1005, 13:10-12 (“VTA 84 is configured to receive video data bitstreams”); 10:18-30 (disclosing that VTAs will filter data packets including MPEG-4 video)), and as Dr. Chatterjee explains, the MPEG-4⁴ video standard supports multiple “*scalable coding*” modes such as spatial scalability, temporal scalability, quality scalability, Fine Grain Scalability (FGS). Ex.1003, ¶¶44-45 (citing Ex.1015, pp. 142 (“Scalable encoding of video data enables a decoder to decode selectively only part of the coded bitstream. The coded stream is arranged in a number of *layers*, including a ‘base’ layer and one or more ‘enhancement’ layers.... MPEG-4 Visual supports a number of scalable coding modes.”), 145), see also Ex.1019, 1103, 1104, 1113 (disclosing

² Emphasis added when bolded throughout unless noted.

³ The Petition refers to “*video router*” as a default for the sake of brevity, but use of such the term encompasses “*scalable video coding router*,” unless specifically stated otherwise.

⁴ Dr. Chatterjee also explains that the earlier MPEG-2 video standard supports scalability. Ex.1003, ¶49 (citing Ex.1016, 10).

multiple scalable modes supported by MPEG-4). Dr. Chatterjee further explains that the term “*coding*” in the context of a “*scalable video coding router*” suggests that Shao-028’s VTA Router is configured to handle coded “audio-visual information (e.g., movies, video, music) in a digital compressed format” according to a standard, such as MPEG-4. Ex.1003, ¶¶75-77 (citing Ex.1005, 4:41-45).

Shao-028 explains the benefit of using a “scalable transmission scheme” is that it “allows different users to receive different quality levels of video data bitstreams” based on “network conditions and/or client preferences.” Ex.1005, 13:1-5 and 1:8-12. The “scalable transmission scheme” in Shao-028 takes into consideration “client interaction and [the] video content itself” during transmission. Ex.1005, Abstract. In particular, Shao-028 discloses:

Methods . . . to **prioritize/classify different types of information according to their importance** and to packetize or otherwise arrange the prioritized information in a manner such that lower priority information may be dropped during transmission. Thus, when network congestion occurs or there is not enough network bandwidth to transmit all of the prioritized information about an object, some (e.g., lower priority) information may be dropped at the server or at an intermediate network node to reduce the bit rate.

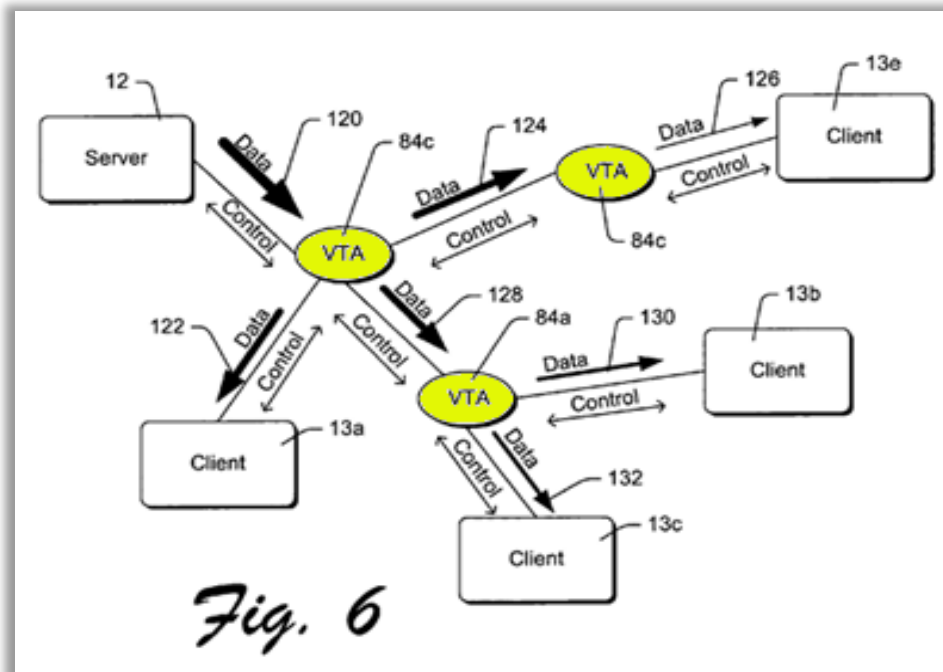
Ex.1005, Abstract (emphasis added). Shao-028 further explains that “data packets containing texture information for a particular video object may be dropped by the VTA.” Ex.1005, 10:28-30. Ex.1003, ¶78.

Shao-028’s VTA Router also operates in a multicast network environment (e.g., depicted in Figs. 3 and 6) like that described in the 372 Patent (e.g., depicted in Fig. 1), and it comprises the same components and provides the same functionality as the claimed “*video router / scalable video coding router*” of the 372 Patent. Ex.1003, ¶¶80-87.

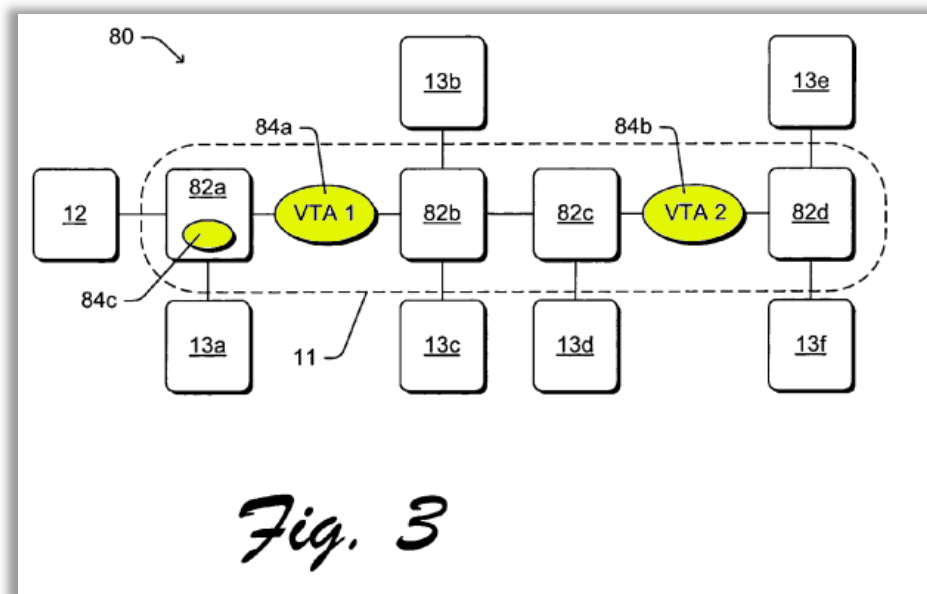
To the extent that PO contends that “VTA” is distinguishable as software, Shao-028’s disclosure of implementing a VTA “**as a component of the router or gateway, a server or part of a server attaching to the router**” (see Ex.1005, 13:24-31) is analogous to the 372 Patent’s disclosure of “**software implemented routers.**” Ex.1001, 3:26-41, 5:33-38, 21:25-26, 21:38-40. Moreover, given Shao-028’s disclosure that a VTA could be implemented as a “component of [a] router,” (Ex.1005, 13:24-31), Dr. Chatterjee explains that there are only a finite number of ways to implement the functionality of the VTA in a network component (such as router, gateway, server) and implementing the functionality of the VTA in a router is one such way, which a POSITA would have found it obvious to try, and especially in view of Shao-028’s disclosure. Ex.1005, 13:24-31. In doing so, a POSITA would have a reasonable expectation of success in view of Shao-028’s teachings that VTA

Routers can be “configured to watch a known port, intercept requests and adapt the data bitstream accordingly,” or otherwise perform router-like functions. Ex.1005, 13:25-28. Ex.1003, ¶79.

Shao-028 further explains that a VTA Router—“can be any type of general purpose and/or special purpose computing/communication device, such as, a server, a gateway, a router, a computer, etc.” Ex.1005, 13:24-31, 8:51-54. Shao-028 also discloses various router-like functionalities of its VTA Routers, including capability to watch a known port, intercept requests, and adapt the data bitstream accordingly. Ex.1005, 13:24-31.



Ex.1005, Figure 6 (annotated).



Ex.1005, Figure 3 (annotated). Ex.1003, ¶81.

Accordingly, Shao-028's VTA Router discloses the claimed “video router” and “scalable video coding router.”

The system described in Shao-028 facilitates transmission of video data over a network (“[a] method for transmitting video signals”). For example, the architecture depicted in Figure 6 corresponds to “a **video multicasting** system architecture” and includes three VTAs (annotated in yellow, above) referenced as VTA 84a, VTA 84b, VTA 84c. Ex.1005, Fig. 3, 8:46-48. Shao-028 explains that the “output from VTA 84a is provided to . . . network node 82b” which is “operatively coupled to **provide data packets** [“transmitting video signals”] to client devices 13b, 13c and . . . network node 82c.” Ex.1005, 8:61-64; *see also* Ex.1005, 9:2-8 (providing similar descriptions of VTA 84b and 84c). Similarly, figure 6 depicts

“how a plurality of VTAs can be used to control the flow of packetized data between server device 12 and a plurality of clients 13a, 13b, 13c, and 13e with respect to **multicasting of video data** [“*transmitting video signals*”].” Ex.1005, 9:54-58. Ex.1003, ¶83, *see also* ¶¶84-87. Shao-028 teaches “[a] **scalable video transmission scheme ... [which includes] [m]ethods . . . to prioritize/classify different types of information according to their importance** and to packetize or otherwise arrange the prioritized information in a manner such that lower priority information may be dropped **during transmission.**” Ex.1005, Abstract.

Therefore, Shao-028 discloses a “method for transmitting video signals.”

Accordingly, Shao-028 teaches or suggests elements [1.0], [6.0], and [11.0].

2. Memory

- a. [1.1] a memory; and
- b. [11.1] a memory; and

Shao-028 discloses its VTA Router (“*video router*”) comprises “*a memory*.”

As demonstrated above, Shao-028’s VTA can be “implemented as a component of the router or gateway, a server or part of a server attaching to the router.” Ex.1005, 13:24-31. Moreover, as Dr. Chatterjee explains and Shao-028 confirms, components like a router (such as the VTA Router) “typically includes many or all of the elements described . . . **relative to computer 20.**” Ex.1005, 7:58-61. Shao-028 discloses that such a computer would comprise “**a system memory**”

[a memory”] which “**includes read only memory (ROM) [] and random access memory (RAM)[]**.” Ex.1005, 7:5-7, 7:13-14. Ex.1003, ¶¶91-92.

Shao-028 additionally discloses using “a hard disk,” “a removable magnetic disk,” and “a removable magnetic disk” in devices like computer 20. For example, Shao-028 explains that “[c]omputer 20 further includes a hard disk drive 27 for reading from and writing to a hard disk, not shown, a magnetic disk drive 28 for reading from and writing to a removable magnetic disk 29, and an optical disk drive 30 for reading from or writing to a removable optical disk 31 such as a CD ROM, DVD ROM or other optical media.” Ex.1005, 7:18-23. Ex.1003, ¶¶93-94.

Accordingly, Shao-028 teaches or suggests elements [1.1] and [11.1].

3. Processor

- a. **[1.2] a processor, wherein the processor executes instructions stored in the memory to cause the video router to:**
- b. **[11.2] a processor, wherein the processor executes instructions stored in the memory to cause the scalable video coding router to:**

Shao-028 discloses its VTA Router comprises “a processor, wherein the processor executes instructions stored in the memory to cause the [video router / “scalable video router”] to.”

As demonstrated above, *see* §VIII.A.2, components like a router (such as the VTA Router) “typically includes many or all of the elements described . . . **relative**

to computer 20.” Ex.1005, 7:58-61. Shao-028 discloses that such a computer includes a “one or more processors or processing units [*“a processor”*].” Ex.1005, 7:5-8.

Shao-028 further discloses that the VTA Router’s “*memory*” would store “basic input/output system (BIOS) 26, containing the basic routines that help to transfer information between elements within computer 20, such as during start-up” and further that “[t]he drives [such as a hard disk, a removable magnetic disk 29 and a removable optical disk 31] and their associated computer-readable media provide nonvolatile storage of computer readable instructions, data structures, program modules and other data for computer 20.” Ex.1005, 7:14-17, 7:27-20. Dr. Chatterjee explains that the VTA Router—equipped with “*a processor*” and a “*memory*”—would use such components together to “*execute instructions stored in the memory.*” Ex.1003, ¶97 (citing Ex.1018, 132 (“The CPU is the device that interprets and executes instructions.”))

Accordingly, Shao-028 teaches or suggests elements [1.2] and [11.2].

4. Receiving a layered video data stream

- a. [1.3] receive a layered video data stream including a base layer and a set of enhancement layers,
- b. [6.1] receiving a layered video data stream comprising a base layer and a set of enhancement layers;
- c. [11.3] receive a layered video data stream that comprises a base layer and a set of enhancement layers,

Elements [1.3], [6.1], and [11.3] generally describe “receiv[ing] a layered video data stream [including / comprising / that comprises] a base layer and a set of enhancement layers.”

Initially, the concept of receiving “*layered video data stream*” transmissions was well-known to POSITAs. Ex.1003, ¶36 (citing Ex.1014, 50 (“This concept of layering a live multicast stream and allowing receivers to receive as many layers as bandwidth capacities permit, is an active area of research.”))).

Shao-028’s VTA Router discloses a “*video router*” that “*receive[s] a layered video data stream.*” For example, Shao-028 discloses that “**VTA 84 is configured to receive video data bitstreams**” (“*video data stream*”) from server 12 or a previous VTA.” Ex.1005, 13:10-12. In Shao-028, the VTA Router “*receive[s]* the prioritized object-based data packets” including a “video object” from the server device, Ex.1005, 3:4-10, which Dr. Chatterjee explains would be included in a “*video data stream.*” Ex.1003, ¶¶101-102 (citing Ex.1005, 5:6-10 (“For video

object, each of these media objects is encoded into a corresponding data bitstream using I, P, B, and enhancement layers.”)

The “video data bitstreams” (“*video data stream*”) received at the VTA Router constitutes a “*layered*” video data stream. For example, the techniques in Shao-028 utilize MPEG-4⁵ encoding which uses “**I, P, B, and enhancement frame layers**” to encode a media object into a video data stream. Ex.1005, 5:6-10.

For video object, each of these media objects is encoded into a corresponding elementary data bitstream using I, P, B, and enhancement frame layers.

Ex.1005, 5:6-10. As demonstrated below, Dr. Chatterjee explains that a video data stream formed using MPEG-4 encoding and using I, P, B, and enhancement frame layers is a “*layered*” video data stream. For example, Shao-028 explains that “Encoder 15 [included within server device 12] ... [is] configured to encode the object data into one or more bitstreams” and can be “a Moving Picture Experts Group (MPEG) based encoder” and MPEG allows coding “frames, or ... **objects as separate frame layers.**” Ex.1005, 4:40-43, 4:52-55, Fig. 1. Accordingly, Shao-028’s disclosure of “video data bit streams” received by the VTA Router constitute a “*layered video data stream.*” Ex.1003, ¶102.

⁵ MPEG-4 is an ISO/IEC standard developed by MPEG (Moving Picture Experts Group). <https://www.mpeg.org/standards/MPEG-4/>

Shao-028 also discloses that “*a base layer and a set of enhancement layers*” are included in the “*layered video data stream.*” Shao-028 provides an example identifying “Intra (I) coded frame layers, Predicted (P) frame layers, Bi-directionally (B) predicted frame layers” (e.g., see items 2-10 annotated in purple below) as “*base layer[s]*” and “Intra (I) coded frame enhancement layers, Predicted (P) frame enhancement layers, and Bi-directionally (B) predicted frame enhancement layers” (e.g., see items 11-13 annotated in blue below) as “*a set of enhancement layers.*” Ex.1003, ¶103.

Shao-028 explains that the information in the data bitstream of object-based video coding, such as, MPEG-4, can be divided into the following types of information:

1. Control information, (e.g., Video Object Head, Video Object Layer Head and Video Object Plane head);
2. Shape information of an Intra (I) coded frame base layer
3. Texture DC information of an Intra (I) coded frame base layer
4. Texture AC information of an Intra (I) coded frame base layer
5. Shape information of a Predicted (P) frame base layer
6. Motion information of a Predicted (P) frame base layer
7. Texture information of a Predicted (P) frame base layer
8. Shape information of a Bi-directionally (B) predicted frame base layer

- 9. Motion information of a Bi-directionally (B) predicted frame base layer
- 10. Texture information of a Bi-directionally (B) predicted frame base layer
- 11. Intra (I) coded frame enhancement layer
- 12. Predicted (P) frame enhancement layer
- 13. Bi-directionally (B) predicted frame enhancement layer

Ex.1005, 5:39-62. Ex.1003, ¶104.

Shao-028 further explains that media objects included in MPEG-4 video data “may be represented by Intra (I) coded frame layers, Predicted (P) frame layers, Bi-directionally (B) predicted frame layers, Intra (I) coded frame enhancement layers, Predicted (P) frame enhancement layers, and Bi-directionally (B) predicted frame enhancement layers.” Ex.1005, 2:35-42. As Dr. Chatterjee explains, the term “*enhancement layer*” appearing in these layers indicates that these are “*a set of enhancement layers.*” Additionally, the remaining layers disclosed by Shao-028—“Intra (I) coded frame layers,” “Predicted (P) frame layers,” “Bi-directionally (B) predicted frame layers”—correspond to the claimed “*base layer[s]*.” Ex.1003, ¶105.

Shao-028 describes the functionality provided by the I, P, and B base layer frames:

“I” or intra frame . . . is a frame coded as a still image without using any past history.

“P” or Predicted frame . . . is predicted from the most recent I frame or P frame. Each macroblock of data within in a P frame can either come with a vector and difference differential cosine transform (DCT) coefficients for a close match in the last I or P, or it can be “intra” coded (e.g., as in the I frames).”

“B” or bi-directional frame . . . is predicted from the closest two I frames or P frames, e.g., one in the past and one in the future. .

Ex.1005, 4:56-67.

Shao-028 teaches that in addition to I, P, and B base layer frames, **“enhancement I, P, or B frame layers may be provided to add additional refinement/detail to the image.”** Ex.1005, 5:2-5. Indeed, Shao-028 discloses enhancement layers as **additional** to the base layer because Shao-028 states that “I, P, B, **and** enhancement frame layers” are used for encoding media objects into a video data bitstream. Ex.1003, ¶106.

Accordingly, Shao-028 teaches or suggests elements⁶ [1.3], [6.1], and [11.3].

5. Identifying bandwidth-limited conditions

a. [1.4] identify bandwidth-limited conditions of an internet protocol network between the video router

⁶ PO mapped these claim elements to generic descriptions of base layer and enhancement layer in H.264 and MPEG-4 video coding standards. Ex.1007, 8-11; Ex.1003, ¶107.

and a plurality of video receivers,

- b. [6.2] identifying bandwidth-limited conditions of an internet protocol network between a video router and a plurality of video receivers;**
- c. [11.4] identify bandwidth-limited conditions of an internet protocol network between the video router⁷ and a set of video receivers, and**

Elements [1.4], [6.2], and [11.4] recite “identify[ing] bandwidth-limited conditions of an internet protocol network between [a / the] video router and a [plurality / set of] of video receivers.”

Initially, the term “*bandwidth-limited conditions*” does not appear in the specification. Instead, the specification describes generic functions related to congestion, bandwidth, connection quality, or capacity, such as “manag[ing] congestion,” “manag[ing] the available bandwidth,” or “measur[ing] the quality of [a] connection.” *See, e.g.*, Ex.1001, 4:8-14, 7:57-63, 10:33-36, 4:29-35, 17:50-57, 29:26-49, 20:65-21:2, 21:12-15, 21:42-45, 21:63-66, 22:63-65. And while the specification describes links / network connections as being “slow” or “fast,” it does not explain or quantify what it means to be “slow” or “fast.” Ex.1001, 4:12-13 (“overloaded links”), 8:16 (“infinitely slow link”), 29:21 (“a router interface with a slow connection”), 32:58-60 (“network saturation slows down the links”), 26:51-52

⁷ It appears that the use of “*video router*” here instead of “*scalable video coding router*” is a typographical error.

(“the connection between the routers was not fast enough to transmit all the packets”). Ex.1003, ¶110.

Explaining that that no construction was necessary for this phrase at the district court, PO’s expert stated that “*identify bandwidth-limited conditions*” “refers to the action of recognizing or determining situations where the available bandwidth within the network is restricted or constrained” and further that “congestion” and “packet loss” are “key indicators of bandwidth-limited conditions.” See Ex.1020, ¶¶63 and 77. Ex.1003, ¶111.

As demonstrated below, Shao-028 discloses elements [1.4], [6.2], and [11.4] at least consistent with PO’s assertion that “congestion” and “packet loss” are “key indicators of bandwidth-limited conditions.” Ex.1003, ¶111 (citing Ex.1020, ¶¶63, 77, 84).

First, Shao-028 describes use “*of an internet protocol network between the video router and a [plurality of video receivers / set of video receivers].*” For example, Shao-028 discloses transmissions over “a packet-switched network 11” (“an internet protocol network”) with “a plurality of client devices 13(a) . . . 13(n)” (“a plurality of video receivers”) and further that “[o]ne example of a packet-switched network is **the Internet.**” Ex.1005, 4:18-22, 1:51-52. Shao-028 explains that his techniques “allow[] for efficient object-based video **transmission over IP based networks.**” Ex.1005, 10:42-44. “**During transmission, the data within a**

compressed video bitstream is packetized and the packets are sent to the receiver⁸ over the Internet.” Ex.1005, 10:62-11:1. Ex.1003, ¶¶112-114, *see also* Ex. 1007, 13. Further, as Shao-028 explains with reference to Fig. 6, VTA 84c (“*the video router*”) “**support[s] multicasting**” which provides “effective communication **support for multi-party multimedia applications**, such as, **distance learning** and **video broadcasting**” to client devices 13a, 13b, 13c, 13e “*a [plurality of video receivers / set of video receivers].*” Ex.1005, 13:32-33, 11:16-18. “Multicasting” is “[t]he process of sending a message simultaneously to **more than one destination** on a network.” Ex.1018, 352 (emphasis added). Further, as Shao-028 explains with reference to Fig. 6, VTA 84c (“*the video router*”) “**support[s] multicasting**” which provides “effective communication **support for multi-party multimedia applications**, such as, **distance learning** and **video broadcasting**” to client devices 13a, 13b, 13c, 13e “*a [plurality of video receivers / set of video receivers].*” Ex.1005, 13:32-33, 11:16-18. “Multicasting” is “[t]he process of sending a message simultaneously to **more than one destination** on a network.” Ex.1018, 352

⁸ Shao-028 uses the term “receiver” to refer to the client devices and VTAs depicted in Figs. 3 and 6. Shao-028 encompasses transmitting to “*a plurality of receivers*” because Shao-028 describes that if a real-time encoded video “needs to be sent to multiple heterogeneous receivers simultaneously, the single bit rate may not satisfy all receivers.” Ex.1005, 11:64-66.

(emphasis added). Thus, Shao-028 discloses use “*of an internet protocol network between the video router and a [plurality of video receivers / set of video receivers].*”

Accordingly, Shao-028 discloses “an internet protocol network between the video router and a [plurality of video receivers / set of video receivers].”⁹

Shao-028 also describes “*identify[ing] bandwidth-limited conditions of*” such “*an internet protocol network*” in several ways. Ex.1003, ¶¶115-116.

Initially, Shao-028 discloses “*identifying bandwidth-limited conditions*” by “meet[ing] [Quality of Service] QoS requirements.” Ex.1005, 8:43. Shao-028 explains that “when the Internet is congested, some of the data packets may be dropped or otherwise lost during transmission” and “missing data packets can significantly degrade the performance of a multimedia application.” Ex.1005, 1:54-63. Dropping data packets with lower priorities ensures that packets with higher priorities get delivered, which “allows for different QoS’s to be provided based on the importance associated with the user and/or information content.” Ex.1005, 8:14-23. Shao-028 states that “lost or untimely receipt of data packets” (e.g., “*bandwidth-limited conditions*”) can result in failure to meet the expected or required QoS. Ex.1005, 1:45-53. Indeed, the system in Shao-028 is designed to “meet QoS requirements” because Shao-028’s methods and arrangements are “provided to

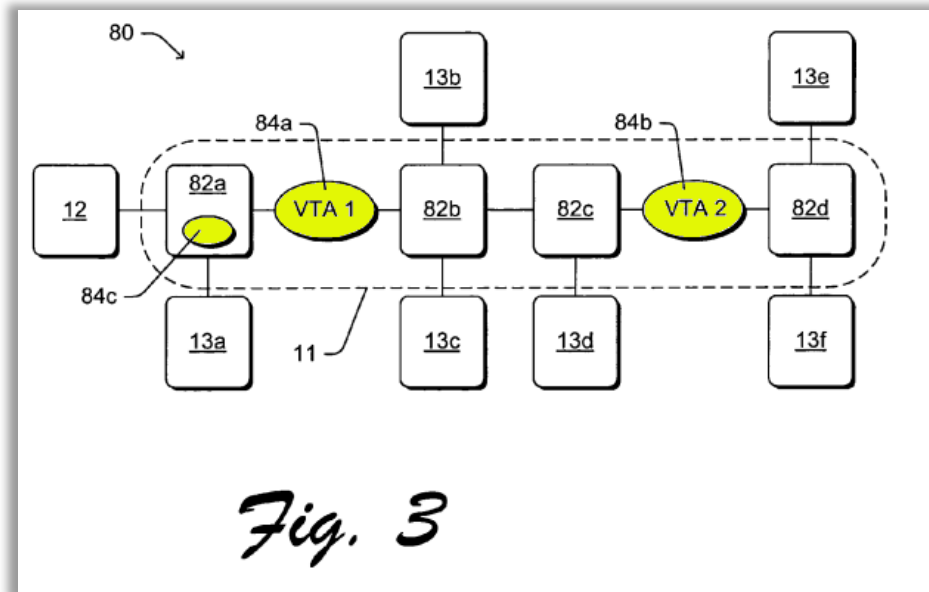
⁹ Petitioner notes that PO mapped this claim element to generic packet communications over the Internet in its infringement contentions. See Ex.1007, 13.

significantly increase the Quality of Service (QoS) provided by packet-switched networks during the transmission of time-critical data streams.” Ex.1005, 8:43, 2:3-7. Ex.1003, ¶117.

Additionally, Shao-028 explains that “under the same network bandwidth and packet loss conditions,” its “methods and arrangements perform better than traditional approaches.” Ex.1001, 14:9-12; *see also* Ex.1001, 14:13-41 (describing examples that use “network bandwidth” and “packet loss”).

Shao-028 recognizes that “due to the heterogeneity of the Internet a single sender transmission rate cannot satisfy the different bandwidth requirements of different clients.” Ex.1005, 11:18-21. During transmissions, for instance, “network congestion” can occur and/or “the receivers [may] require lower bit rates.” Ex.1005, 12:26-29. Therefore, in view of the “network related constraints” and/or “the needs of the client devices” the VTA Routers respond accordingly. Ex.1005, 10:1-5.

For example, with reference to Fig. 3 (reproduced below), “VTA 84a is configured to selectively filter out or otherwise drop data packets according to their respective transmission priority levels **based on network and/or other recognized needs (e.g., downstream feedback/control)**” and “VTA 84 b is configured to selectively filter out or otherwise drop data packets according to their respective transmission priority levels **based, again, on network and/or other recognized needs.**” Ex.1005, 8:57-60, 8:66-9:2.



Ex.1005, Figure 3 (annotated). Ex.1003, ¶114.

Dr. Chatterjee explains that Shao-028 recognizes that communicating over the Internet can cause “**congestion**” which is a network-related constraint and as a result, VTA Routers drop data packets having lower priority: “when the Internet or a portion thereof is **congested, data packets with lower priorities may get dropped/delayed** to better ensure that packets with higher priorities get delivered.” Ex.1005, 8:14-17; *see also* Ex.1005, Abstract (“[W]hen network congestion occurs or there is not enough network bandwidth to transmit all of the prioritized information about an object, some (e.g., lower priority) information may be dropped at the server or at an intermediate network node to reduce the bit rate.”). Ex.1003, ¶¶116-117 (citing Ex.1005, 3:10-16 & 10:23-25).

In Shao-028, a VTA Router thus “*identifies bandwidth-limited conditions*” (e.g., upstream and downstream congestion) by using a **resource allocation policy** that calculates **available resource** and **required resource** (e.g., “network bandwidth” can be one of the resources) for a network link. Shao-028 further explains that upstream congestion is “**determined by the link state between the VTA and its next upstream VTA (or the server 12 if it has no upstream VTA)**” and downstream congestion is “**determined by (Capacity, Requirement) of all its next downstream VTAs and the clients connecting directly to this VTA**” Ex.1005, 13:39-47. Shao-028 explains that its **resource allocation policy** is mathematically expressed using the two-element set “(Capacity, Requirement)” and employed at a VTA to determine **available resource** and **required resource** to support a multicasting session. Ex.1003, ¶118 (citing Ex.1005, 13:31-35).

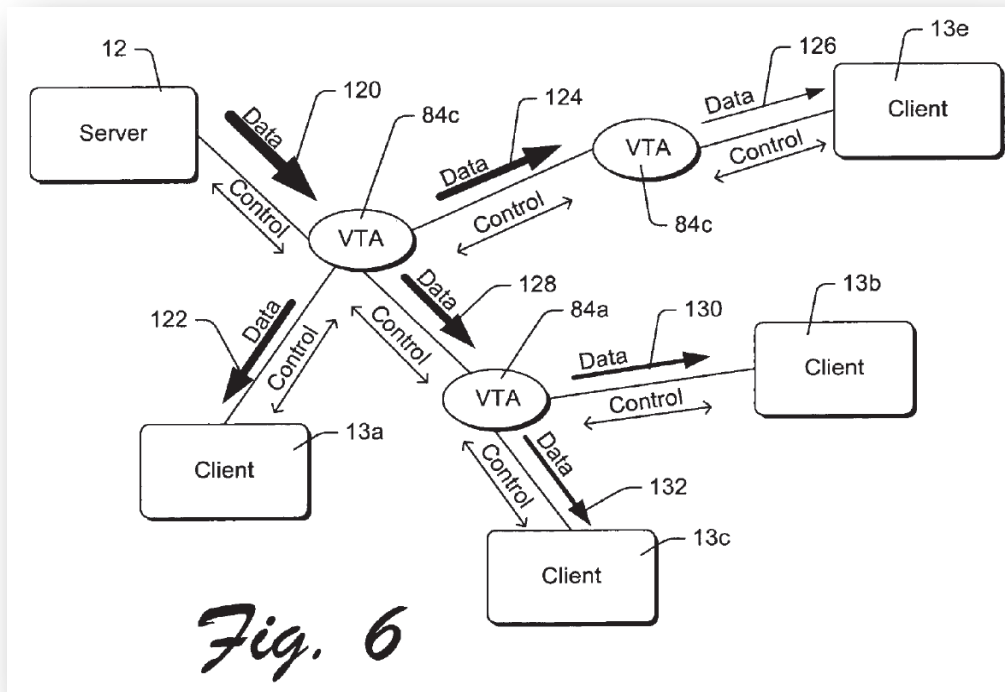
Dr. Chatterjee explains **Capacity** and **Requirement** in Shao-028. “**Capacity** represents the amount of the resource available for a video object in the VTA or the end system of the user to handle the video object. **Requirement** represents the amount of the resource for a video object required by the VTA or the user.” Ex.1005, 13:35-39. According to Dr. Chatterjee, ‘Capacity’ and ‘Requirement’ are therefore parameters or metrics for making the assessment of “*bandwidth-limited conditions*.” Ex.1003, ¶119.

Moreover, Shao-28 explains that its **resource allocation policy** used for identifying **available resource** and **required resource** at a VTA Router pertain to the network links which include “all its next downstream VTAs and **the clients connecting directly to this VTA.**” Ex.1005, 13:44-47. Accordingly, “*identifying bandwidth-limited conditions*” in the network links between a VTA Router and “**clients**” connected to the VTA Router constitute “*identify[ing] bandwidth-limited conditions of an internet protocol network between the video router and a plurality of video receivers.*” Ex.1003, ¶119.

Shao-028’s disclosure of VTA Routers “*identifying bandwidth-limited conditions*” using a **resource allocation policy** is consistent with PO’s statements during prosecution that the claimed “*video router*” “*identifies bandwidth-limited conditions.*” Ex.1003, ¶120 (citing Ex.1002).

For example, Shao-028 demonstrates how “a plurality of VTAs can be used to control the flow of packetized data between server device 12 and a plurality of clients 13a, 13b, 13c, and 13e with respect to multicasting of video data.” Ex.1005, 9:54-58. Referencing Figure 6 and as depicted below, Shao-028 explains that the “various nodes have bi-directional feedback/control communication capabilities,” Ex.1005, 9:54-59, such that “**VTAs are able to respond dynamically to the needs of the client devices.**” Ex.1003, ¶121.

In addition to “needs of the client devices,” VTA Routers may also respond to network related constraints. Ex.1005, 10:1-5 (“B]oth network and user interactivity behaviors are taken into consideration.”) Shao-028 explains that “VTA 84 a ... selectively filter[s] out or otherwise drop[s] data packets according to their respective transmission priority levels based on network and/or **other recognized needs (e.g., downstream feedback/control)**,” Ex. 1005, 8:57-60, and “VTA 84b ... selectively filter[s] out or otherwise drop[s] data packets according to their respective transmission priority levels **based, again, on network and/or other recognized needs**,” Ex. 1005, 8:66-9:2. For example, “VTAs will filter out data packets from upstream according to downstream requirements (e.g., according to the network link and **a particular client[']s capabilities**).” Ex. 1005, 10:26-28.



Ex. 1005, Fig. 6. Ex.1003, ¶121.

In addition, Shao-028 explains that information related to a client’s needs and/or capabilities are signaled as feedback is received at a VTA Router in the form of “**control requests from the client device.**” Ex.1005, 3:4-10. Shao-028 further explains that “**the control paths provide a mechanism for negotiating or otherwise establishing** what object data 14 needs to be transmitted and how best to allocate limited bitrate among multiple video objects according to network state and users’ interaction.” Ex.1005, 10:13-15. Ex.1003, ¶121.

Shao-028 therefore also explains that a client (or “*receiver*”) is involved in “*identify[ing] bandwidth-limited conditions of an internet protocol network between*

the video router and a plurality of video receivers” by signaling information related to its needs to the VTA Router in the form of feedback. Ex.1003, ¶¶121-122 (citing Ex.1010, 8-9).

Accordingly, Shao-028 teaches or suggests elements [1.4], [6.2], and [11.4].

6. Forwarding the base layer

- a. **[1.5] forward the base layer from the video router to at least two of the plurality of video receivers via the internet protocol network, and**
- b. **[6.3] forwarding the base layer to at least two of the plurality of video receivers via the internet protocol network; and**
- c. **[11.5] forward the base layer from the video router to at least two of the set of video receivers;**

Elements [1.5], [6.3], and [11.5] generally relate to “forward[ing] the base layer from the video router to at least two of the plurality of video receivers via the internet protocol network.”

Shao-028 discloses a VTA Router “*forward[ing] the base layer.*” Shao-028 explains that a VTA Router “is configured to receive video data bitstreams from server 12 or a previous VTA, filter the received data bitstream by selectively discarding data packets having lower priorities, and **sending the resulting filtered data bitstream to a client 13** and/or a next (downstream) VTA 84” and describes an example in which the data bit stream includes ten different layers, including the “*base layer.*” Ex.1005, 5:39-58. Shao-028 explains that “[m]edia objects included

in MPEG-4 video data “may be represented by Intra (I) coded frame layers, Predicted (P) frame layers, Bi-directionally (B) predicted frame layers.” Ex.1005, 2:35-39. Thus, Shao-028 discloses “*forward[ing] the base layer*” by the VTA Router. Ex.1003, ¶125.

Shao-028 further discloses that information (“the base layer”) is forwarded “to at least two of the [plurality of video receivers / set of video receivers] via the internet protocol network.”

As Shao-028 explains, a VTA Router can transmit the base layer information to at least two client devices, *e.g.*, during a multicasting session. For example, as depicted in Figures 3 and 6, Shao-028 explains that “VTA 84 ... **support[s] multicasting**” which provides “effective communication **support for multi-party multimedia applications**, such as, **distance learning** and **video broadcasting** [“*to at least two of the [plurality of video receivers / set of video receivers].*” Ex.1005, 13:32-33, 11:16-18. For example, Fig. 6 depicts VTA 84a transmitting information to client devices 13b and 13c during a multicasting session. “Multicasting” is “[t]he process of sending a message simultaneously to **more than one destination** on a network.” Ex.1018, 352 (emphasis added). Indeed, Shao-028 also describes sending a real-time encoded video (comprising a “*base layer*”) “to **multiple heterogeneous receivers simultaneously** [“*to at least two of the [plurality of video receivers / set of video receivers].*” Ex.1005, 11:64-66. Ex.1003, ¶126.

Accordingly, Shao-028 teaches or suggests elements [1.5], [6.3], and [11.5].

7. Forwarding all of the set of enhancement layers

- a. [11.6] wherein the scalable video coding router forwards all of the set of enhancement layers to at least two of the video receivers in the set of video receivers with bandwidth-sufficient conditions;**

Although the term “*bandwidth-sufficient conditions*” does not appear in the 372 Patent specification, it does describe the network as having “sufficient” or “insufficient” bandwidth or capacity. *See, e.g.*, Ex.1001, 1:55-57 (“video stream is transmitted at a fixed high rate and not all **parts of the network are likely to have sufficient bandwidth** available to forward the stream.”); *see also* Ex.1001, 4:33-37; 21:42-45; and 31:19-23 (similar disclosures). Ex.1003, ¶129.

Additionally, in support of PO’s assertion that no construction is necessary for this term at the District Court, PO’s expert stated that “‘bandwidth sufficient conditions’ describes network conditions where the available bandwidth (traffic capacity) is adequate to support the transmission of all the enhancement layers of the video stream without causing congestion or degradation in quality.” Ex.1020, ¶144.

Therefore, as demonstrated below, Shao-028 teaches or suggests element [11.6] consistent with Patent Owner’s or any reasonable interpretation.

Shao-028 recognizes that communicating over the Internet can cause “congestion” and as a result, VTA Routers drop data packets having lower priority: “when the Internet or a portion thereof is congested, **data packets with lower priorities may get dropped/delayed** to better ensure that packets with higher priorities get delivered.” Ex.1005, 8:14-17; *see also* Ex.1005, Abstract (“[W]hen network congestion occurs or there is not **enough network bandwidth to transmit all of the prioritized information about an object**, some (e.g., lower priority) information may be dropped at the server or at an intermediate network node to reduce the bit rate.”). Ex.1003, ¶¶130-131 (citing Ex.1005, Abstract, 3:10-16; 10:23-25).

Accordingly, Dr. Chatterjee explains that when no packets are discarded, “**all of the prioritized information about an object**”—which would include “*all of the set of enhancement layers*”—are forwarded because there is no network congestion, *i.e.*, the network has “enough bandwidth” or otherwise has “*bandwidth-sufficient conditions*” Ex.1005, Abstract. Ex.1003, ¶132, *see also* Ex.1003, ¶44 (citing Ex.1015, Fig. 5-57 and 142 (teaching an example of “receiv[ing] all layers”)).

In addition, for the reasons already demonstrated above, Shao-028 also discloses forwarding information to “*at least two of the video receivers in the set of video receivers.*” *See* [VIII.A.6], above.

Accordingly, Shao-028 teaches or suggests element [11.6].

8. Selectively Forwarding

- a. [1.6] selectively forward one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the plurality of video receivers through the internet protocol network based upon the identified bandwidth-limited conditions, and
- b. [6.4] selectively forwarding one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the plurality of video receivers through the internet protocol network based upon the identified bandwidth-limited conditions;
- c. [11.7] wherein the scalable video coding router selectively forwards one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the remaining video receivers in the set of video receivers based upon the identified bandwidth-limited conditions;

Element [1.6] recites “selectively forward one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the plurality of video receivers through the internet protocol network based upon the identified bandwidth-limited conditions.” Elements [1.6] and [6.4] generally recite the same limitations.

Initially, “*the remaining video receivers*” claim term in claim element [11.7] appears to apply selectively to certain receivers that do not receive all of the enhancement layers. Elements [1.6] and [6.4] reference “*the plurality of video receivers*” claim term. Shao-028 satisfies both claim terms its teachings of “selective

filtering” capability of VTA Routers which “allows **different users** to receive different quality levels of video data bitstreams.” Ex.1005, 13:1-5 (emphasis added).

First, Shao-028 states that its techniques include “**selective transmission processes that drop data packets as needed** to take advantage of differentiated classes.” Ex. 1005, 10:46-51. The techniques described in Shao-028 “**selectively transmit[s]** object-based data based on data content” (“*selectively forward[ing] one or more of the set of enhancement layers*”) in response “**to dynamically changing network conditions** and/or client preferences” (“*based upon the identified bandwidth-limited conditions*”). Ex. 1005, 1:10-12 (emphasis added). Ex.1003, ¶136.

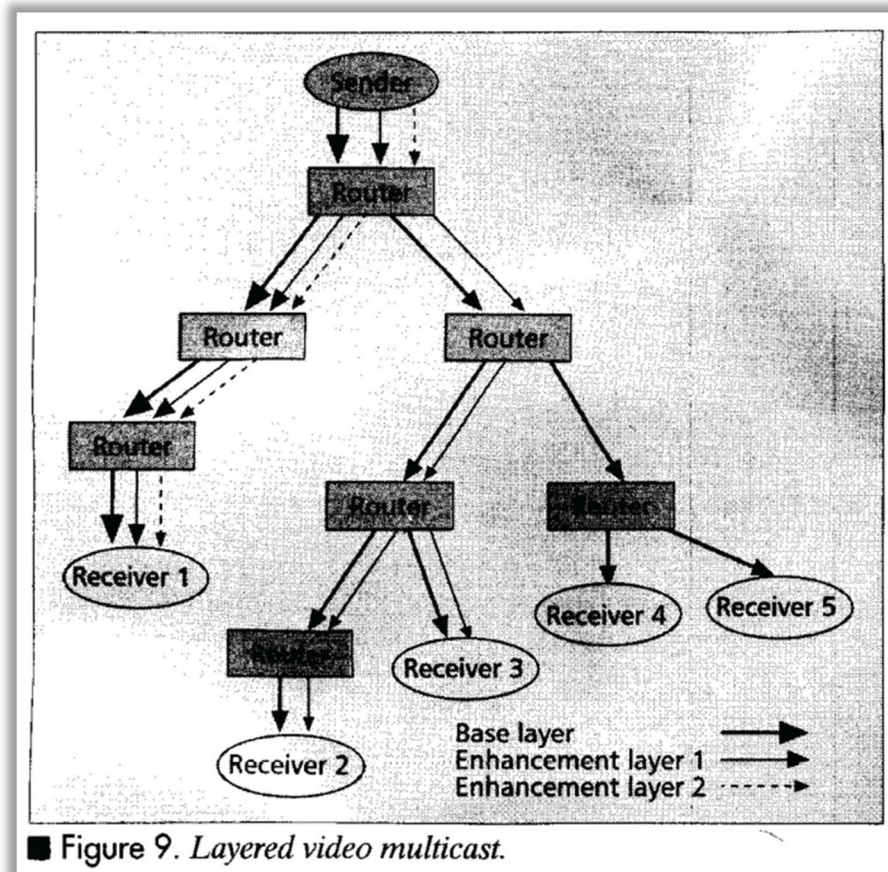
Dr. Chatterjee explains that the “object-based data” in Shao-028 includes “*one or more of the set of enhancement layers*” because Shao-028 teaches states that “each of these media objects is encoded into a corresponding elementary data bitstream using I, P, B, and enhancement frame layers.” Ex.1003, ¶137 (citing Ex.1005, 5:6-10; *see also* Ex.1005, 5:39-62 (listing the enhancement layers included in the object-based data). Moreover, Shao-028 explains that “these frame layers [including “*one or more of the set of enhancements layers*”] may be associated with specific transmission priority levels.” Shao 028 at 2:35-43.

Furthermore, and referencing Figure 6, Shao-028 further discloses that “**VTA 84 a ... selectively filter[s] out or otherwise drop data packets according to their**

respective transmission priority levels (“*selectively forward[ing] one or more of the set of enhancement layers*”) based on network and/or other recognized needs (e.g., downstream feedback/control) [“*based upon the identified bandwidth-limited conditions*”].” Ex.1005, 8:57-60; *see also* 8:66-9:2. In particular, Shao-028 teaches that a VTA “**filter[s] the received data bitstream by selectively discarding data packets having lower priorities**, and sending the resulting filtered data bitstream to a client 13 and/or a next (downstream) VTA 84.” Ex.1005, 13:10-15. Shao-028 is therefore explaining that by “discarding data packets having lower priorities,” “the **resulting filtered data bitstream**” sent to clients is “*fewer than all of the set of enhancement layers*.” Ex.1003, ¶138.

Moreover, Shao-028 states that certain enhancement layers have lower priority than others. *See, e.g.*, Ex.1005, claim 11 (“setting the transmission priority levels ... includes **causing Intra (I) coded frame enhancement layer data to have a higher transmission priority level than Predicted (P) frame enhancement layer data**”). Shao-028 thus demonstrates that the Intra (I) coded frame enhancement layer is “*selectively forwarded*” because the Predicted (P) frame enhancement layer would be dropped “*based upon the identified bandwidth-limited conditions*.” Indeed, as Dr. Chatterjee explains, this technique was well-known to POSITAs at the time—for example, in the 1999 publication entitled “Video multicast over the Internet” states that “the sender sends out video in multiple layers, and each

receiver receives a subset of the video layers commensurate with its processing power and network bandwidth availability. Video layering can be supported by many video compression techniques.” Ex.1003, ¶139 (citing Ex.1013, 7).



Ex.1013, Fig. 9.

Accordingly, Shao-028 discloses “selectively forward[ing] one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers . . . based upon the identified bandwidth-limited conditions.”

In addition, Shao-028 discloses [*“to at least two of the [plurality of video receivers / set of video receivers]”* for the reasons already stated above. See §VIII.A.6.

Accordingly, Shao-028 discloses elements [1.6], [6.4], and [11.7].

9. Transmitting according to an Internet Protocol

- a. [1.7] wherein the video router transmits the layered video data stream according to an internet protocol;**
- b. [6.5] wherein the layered video data stream is transmitted according to an internet protocol; and**
- c. [11.8] wherein the layered video data stream is transmitted according to an internet protocol; and**

Elements [1.7], [6.5], and [11.8] describe “[*the video router*] transmit[ing] the layered video data stream according to an internet protocol.” Shao-028 discloses these elements for the same reasons addressed above with respect to claim limitations [1.3], [6.1], [11.3] (*i.e.*, receiving “a layered video data stream” at a VTA Router) and [1.4], [6.2], [11.4] (*i.e.*, use “of an internet protocol network between the video router and a plurality of video receivers”).

And, as demonstrated below, Shao-028 discloses the VTA Router “transmitting a layered video data stream.” For instance, Shao-028 explains that “VTA 84 is configured to receive video data bitstreams from server 12 or a previous VTA, filter the received data bitstream by selectively discarding data packets having lower priorities, and **sending the resulting filtered data bitstream to a client 13**

and/or a next (downstream) VTA 84” such that the resulting filtered data bit stream is formed using **“I, P, B, and enhancement frame layers.”** Ex.1005, 5:6-10. The techniques in Shao-028 “allows for efficient object-based **video transmission over IP based networks.**” Ex.1005, 10:42-44. **“During transmission, the data within a compressed video bitstream is packetized and the packets are sent to the receiver over the Internet.”** Ex.1005, 10:62-11:1. Ex.1003, ¶142.

Accordingly, Shao-028 discloses that the VTA Router transmits the filtered bitstream (formed using I, P, B, and enhancement frame layers) over IP-based networks constitutes *“the video router transmitting the layered video data stream according to an internet protocol.”*

Accordingly, Shao-028 teaches or suggests elements [1.7], [6.5], and [11.8].

10. Sequence Number of Packets

- a. **[1.8] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and**
- b. **[6.6] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and**
- c. **[11.9] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and**

Elements [1.8], [6.6], and [11.9] describe “wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number.”

The 372 Patent explains that “[a]side from carrying its own sequence number, each packet contains the current sequence number of all the other layers as well. By inspecting these sequence numbers each time a packet arrives, the receiver determines whether it has missed any packets from the layers it marked as reliable.” Ex.1001, 28:61-66. “Not only are the packets inside the individual layers restored to their natural order using their sequence numbers, but the total ordering across the layers may also be restored.” Ex.1001, 30:14-17. The 372 Patent thus explains that “*sequence numbers*” are used for restoring the natural ordering of the packets. And as Dr. Chatterjee explains, at the time of filing of the 372 Patent, using sequence

numbers in IP packet headers was well-known in the art. Ex.1003, ¶145 (citing Ex.1017, 20 (“Sequence numbers are used to keep data in the proper order.”)).

For the reasons demonstrated below, Shao-028 discloses “wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number” as claimed in the 372 Patent.

Shao-028 discloses “Data packets [*“wherein each layer of the layered video data stream comprises data packets”*] 106a-c are ... configured for transmission over network 11, for example, by adding a Network header (NPH) 114[.] NPH may be TCP Header+ IP Header, UDP header+IP Header, IP Header, or other format.” Ex.1005, 9:32-37. Ex.1003, ¶147.

Additionally, Shao-028 explains, “[a]n exemplary data packet 106a is depicted in FIG. 5,” and “[a]s shown, **VPH 110 includes** an object identifier (OI) 110a, **a part number (PN) 110b** and a starting position (SP) 110c **for the first portion (or contiguous portions) of data in data packet 106a (i.e., here, portion 104a).**” Ex.1005, 9:39-41. Shao-028 further explains that “a length (LEN) 112a is provided to establish the length of the first portion (or contiguous portions). **Additional SP 110c** and LEN 112b data are provided following identifying bits 107 to further define portion 104e. **The identifying information in 106a can be used to reconstruct the data bitstream 100,** or remaining portion thereof, after

transmission over network 11.” Accordingly, as in the 372 Patent, “**part number (PN) 110b**¹⁰” discloses the claimed “*sequence number*.” Ex.1003, ¶148.

Additionally, because Dr. Chatterjee explains that Shao-028’s disclosure of “part number” (the “*sequence number*”) would have been understood as identifying information in data packets to reconstruct the data bitstream, Shao-028’s disclosure is consistent with PO’s statements at the district court that the “*sequence number*” is “identification number of the particular packet” included in the packet header. Ex.1003, ¶¶148-149 (citing Ex.1007, 21).

Additionally, to the extent PO contends Shao-028 does not expressly disclose a “*sequence number*” Shao-028 expressly teaches using IPv6 protocol. Ex.1005, 14:1-5, *see also* 8:19-23. Ex.1003, ¶112.

The IPv6 protocol from Internet Engineering Task Force (IETF), described in RFC2507 entitled “IP Header Compression¹¹,” published February 1999 describes the “*sequence number*” field in the header of a packet.

¹⁰ Shao-028’s disclosure is also consistent with PO’s infringement contentions which mapped this claim limitation to generic “identification number of the particular packet” included in the packet header. Ex.1007, 21

¹¹ This document is available online at <https://datatracker.ietf.org/doc/html/rfc2507#section-11.2> (last accessed August 4, 2024).

7.12. TCP Header

The TCP header is described in [RFC-793].

The Next Header field (IPv6) or Protocol field (IPv4) in the preceding subheader is DEF.

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RFC 2507

IP Header Compression

February 1999

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+-----+-----+-----+-----+-----+-----+-----+-----+
|           Source Port           |           Destination Port           |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Sequence Number                               |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Acknowledgment Number                               |
+-----+-----+-----+-----+-----+-----+-----+-----+
| Offset| Reserved |U|A|P|R|S|F|                               Window           |
+-----+-----+-----+-----+-----+-----+-----+-----+
|           Checksum           |           Urgent Pointer           |
+-----+-----+-----+-----+-----+-----+-----+-----+
|                               Options                               |           Padding           |
+-----+-----+-----+-----+-----+-----+-----+-----+

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Ex.1008, 28 (annotated). Ex.1003, ¶150.

11.2. Reordering in TCP packet streams

A compressor may avoid sending COMPRESSED_TCP headers and only send COMPRESSED_TCP_NODELTA headers when there is reordering over the link. Compressed headers will typically be 17 octets with that method, significantly larger than the usual 4-7 octets.

To achieve better compression rates the following method, adding only two octets to the compressed header for a total of 6-9 octets, may be used. A packet sequence number, incremented by one for every packet in the TCP stream, is then associated with each compressed and full header. This allows the decompressor to place the packets in the correct sequence and apply their deltas to the context in the correct order. A simple sliding window scheme is used to place the packets in the correct order.

Ex.1008, 36. Thus, Dr. Chatterjee explains that it would have been known that a “*sequence number*” is applied to each packet in the video data stream and used for re-ordering the packets i.e., “place the packets in the correct sequence.” *Id.* Ex.1003, ¶150 (citing Ex.1005, 9:46-49 (“The identifying information in **106 a** can be used to reconstruct the data bitstream **100**, or remaining portion thereof, after transmission over network **11**.”)).

Accordingly, Shao-028 teaches or suggests elements [1.8], [6.6], and [11.9].

11. Layer Identifier of Packets

- a. **[1.9] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.**
- b. **[6.7] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.**
- c. **[11.10] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.**

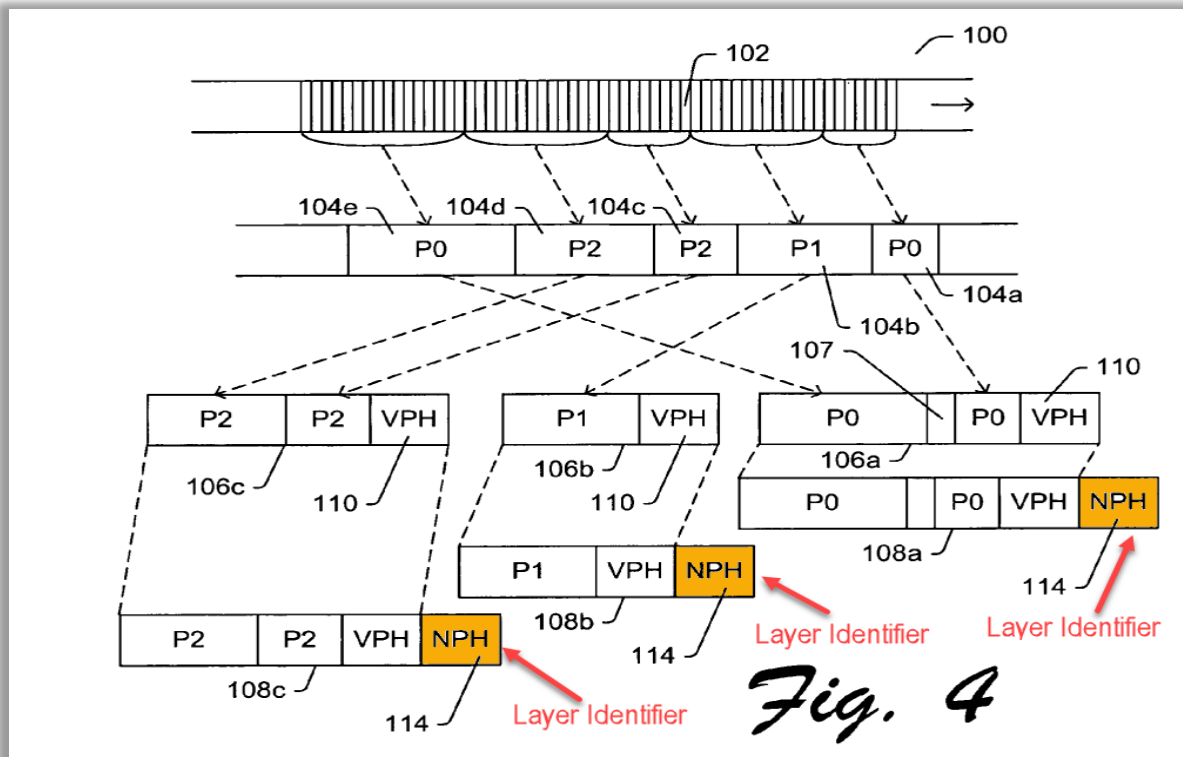
Elements [1.9], [6.7], and [11.10] describe “a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.”

The 372 Patent specification has only one reference to “*layer identifier*.” Ex.1001, 26:62-66 (“To this end it inspects the packet, looks up the multicast group, **the stream layer identifier** and the layer’s sequence number and then checks the

inbound packet buffer 935 to see if it contains the packet.”) In its infringement contentions, PO points to “*layer identifier*” as specified in the H.264 standard, comprised of the set of values including priority_id, dependency_id, quality_id, and temporal_id. Ex.1007, 45; Ex.1003, ¶153.

The “Network Header (NPH)” in Shao-028 corresponds to the “*layer identifier*” claimed in the 372 Patent. Shao-028 teaches using the “Ipv6 protocol.” Ex.1005, 14:1-5. Further, “[d]ata packets 106a-c are then each further configured for transmission over network 11, for example, by adding a Network header (NPH) 114 to create data packets 108a–c. respectively. By way of example, NPH may be TCP Header+ **IP Header**, UDP header+**IP Header**, **IP Header**, or other format. NPH 114 identifies the transmission priority level.” Ex.1005, 9:32-37. Shao-028 explains how the transmission priority level (identified by the “NPH”) is used in transmitting media information. Such techniques include “associating portions of the object-based media information [included in a data bitstream] with a plurality of different transmission priority levels” and further “based at least on the plurality of different transmission priority levels,” “selectively transmitting the portions of the object-based media information over a network.” Ex.1005, 2:12-21. Ex.1003, ¶154.

Fig. 4 (reproduced below) depicts Shao-028’s “Network header (NPH)” for each data packet.



Ex.1005, Fig. 4 (annotated). Ex.1003, ¶155.

With reference to Fig. 4, Shao-028 explains that in the bitstream 100, each of portions 104a-e, is “associated with a specific transmission priority level” and placed in data packets 106a-c such that “portion 104a has a priority level of “P0”, portion 104a has a priority level of “P0”, portion 104 b has a priority level of “P1”, portion 104c has a priority level of “P2”, portion 104 d has a priority level of “P2”, and portion 104e has a priority level of “P0”. Ex.1005, 9:12- 22. Thus, data packet 106a includes “portions 104a and 104e, each of which has a transmission priority level of P0... Similarly, data packet 106b includes portion 104b, which has a transmission

priority level of P1, and data packet 106c includes portions 104c and 104d, each of which has a transmission priority level of P2.” Ex.1005, 9:22-31. Ex.1003, ¶155.

Furthermore, Shao-028 discloses that “base layers” and “enhancement layers” **“can be selectively classified as having different transmission priority levels”** and consequently the **“Network header (NPH)”** (the *“layer identifier”*), which identifies transmission priority levels, *“is based upon a layer to which the packet belongs.”* Ex.1005, 5:39-64 (describing how, based on MPEG-4, the information in a bitstream of object-based video coding can be divided into multiple layers. Ex.1003, ¶156.

Shao-028 explains that the multiple layers “of information can be **selectively classified as having different transmission priority levels.**” Ex.1005, 5:39-64. Shao-028 further discloses *“based at least on the plurality of different transmission priority levels,” “selectively transmitting the portions of the object-based media information over a network.”* Ex.1005, 2:12-21. Thus, in Shao-028, a packet’s “Network header (NPH),” which identifies transmission priority levels for base layers and enhancement layers *“is based upon a layer to which the packet belongs.”* Ex.1003, ¶156.

Further, Shao-028’s disclosure of “Network header (NPH)” identifying a transmission priority level of enhancement layers and used for selectively transmitting media information is consistent with PO’s statements at the district

court that the “*layer identifier*” is a criterion for selectively forwarding enhancement layers. Ex.1003, ¶157 (citing Ex.1010, 9).

Additionally, to the extent one asserts that Shao-028 does not disclose a “*layer identifier*” through its disclosure of an NPH, Dr. Chatterjee explains that a POSITA would have recognized that a data packet in Shao-028 **necessarily** includes a “*layer identifier*” because media objects in MPEG-4 video data “may be represented by Intra (I) coded frame layers, Predicted (P) frame layers, Bi-directionally (B) predicted frame layers, Intra (I) coded frame enhancement layers, Predicted (P) frame enhancement layers, and Bi-directionally (B) predicted frame enhancement layers,” and to “regenerate at least a portion of the encoded data bitstream, decode the resulting data bitstream, and output all or part of object data,” a decoder (e.g., at a client) would use a “*layer identifier*” to determine which portions of the bit stream are to be regenerated and provided as output. Ex.1005, 2:35-42; Ex.1003, ¶158.

Indeed, “the necessary multimedia information” about an encoded media object that is provided to “a client device/application,” would include “*layer identifier[s]*” because Shao-028 teaches encoding media objects “using I, P, B, and enhancement frame layers”—which would necessarily be identified by “*layer identifier[s]*.” Ex.1003, ¶¶158-159 (citing Ex.1005, 2:35-42 & Ex.1021, [0056], Fig. 2(b), [0134] (disclosing a “Video Object Layer (VOL) start code” field for “each layer” comprising “a fixed length (5-bit) start code [that is] unique to the layer” and

used for “detect[ion]” by a VOL start code detector)). Therefore, a POSITA would have additionally understood that such a “*layer identifier*” in Shao-028 would be “*based upon a layer to which the packet belongs.*” See also Ex.1003, ¶46 (citing Ex.1022 disclosing as using “unique codes” defined for “FGS Object Type” for indicating enhancement layers and a “unique code” defined for “AS Object Type” for indicating the base layer.)

Accordingly, Shao-028 teaches or suggests elements [1.9], [6.7], and [11.10].

12. Dependent Claims 2, 7, and 12: Video processing capabilities of the video receiver

- a. [2.0] The video router of claim 1, wherein the video router further selectively forwards the one or more of the set of enhancement layers based on video processing capabilities of the video receiver¹².
- b. [7.0] The method of claim 6, wherein the selectively forwarding step further comprises: selectively forwarding the one or more of the set of enhancement layers based on video processing capabilities of the video receiver⁶.
- c. [12.0] The video router of claim 11, wherein the video router further selectively forwards the one or more of the set of enhancement layers based on video

¹² The term “**the** video receiver” first appears in dependent claims 2 and 7 with the article “**the**” indicating that it is referencing an earlier instance of “the video receiver.” But the claims contain no such earlier use of the term “video receiver” either in dependent claims 2, and 7, nor independent claims 1 and 6 upon which claims 2 and 7 depend from respectively. The petition assumes “**the** video receiver” is intended to be one of the video receivers that the router is selectively forwarding to..

processing capabilities of each of the set of video receivers.

Shao-028 teaches or suggests these elements for the same reasons demonstrated above with respect to claim limitation [1.6], [6.4], and [11.7] which relate to the VTA Router (the “*video router*”) “*selectively forward[ing] one or more of the set of enhancement layers.*” And, explained in further detail below, the “*selectively forward[ing] ...*” in Shao-028 is based on “*video processing capabilities [of the video receiver/ of each of the set of video receivers].*” For example, Shao-028 explains:

The VTAs will filter out data packets from upstream according to downstream requirements (e.g., according to the network link and a particular clients [sic: client’s] capabilities). For example, data packets containing texture information for a particular video object may be dropped by the VTA.

Ex.1005, 10:26-30. Shao-028 explains the varying capabilities of clients diagrammatically. The varying capability of different clients is graphically depicted in Fig. 6 (reproduced below) “by the varying width of data flow arrows 120, 122, 124, 126, 128, 130, and 132; here, wider data arrows represent more data packets being transmitted. Thus, for example, VTA 84c (and possibly other network resources) has dropped some of the data packets received from server device 12 prior

to providing the remaining data packets to VTA 84c, since arrow 120 is wider than arrow 124.” Ex.1005, 10:31-38. Ex.1003, ¶¶165-166.

The methods and arrangements in Shao-028 are configured “to control and respond to the **communication needs of the clients.**” Ex.1005, 11:66-12:2. “[T]he **VTAs are able to respond dynamically to the needs of the client devices,**” which, for example, can be in the form of “control requests from the client device.” Ex.1005, 10:1-5, 3:4-10. For instance, “the receivers [may] require lower bit rates” which Dr. Chatterjee explains is “*based on video processing capabilities of the video receiver.*” Ex.1003, ¶167 (citing Ex.1005, 12:26-29 and 13:30-38).

Further, as explained above, *see* §VIII.A.5, Shao-028 describes that its **resource allocation policy** e.g., (Capacity, Requirement) policy, associated with every VTA and client, is based on “**the amount of the resource available for a video object in the VTA or the end system of the user to handle the video object**” and “**the amount of the resource for a video object required by the VTA or the user.**” Ex.1005, 13:30-38.

Accordingly, Shao-028 teaches or suggests elements [2.0], [7.0], and [12.0].

13. Dependent Claims 3, 8, and 13: Dividing bandwidth and Prioritizing Enhancement Layer Forwarding

- a. **[3.0] The video router of claim 1, wherein the video router divides available bandwidth among a plurality of data streams, and wherein the video router**

prioritizes forwarding of the set of enhancement layers.

- b. [8.0] The method of claim 6, further comprising: dividing available bandwidth among a plurality of data streams; and prioritizing the set of enhancement layers for the selectively forwarding step.**
- c. [13.0] The video router of claim 11, wherein the video router divides available bandwidth among a plurality of data streams, and wherein the video router prioritizes forwarding of the set of enhancement layers.**

For the same reasons addressed above with respect to claim limitation [1.6], [6.4], and [11.7], Shao-028 discloses “*prioritizing the set of enhancement layers for the selectively forwarding step.*” Furthermore, Shao-028 discloses “*dividing available bandwidth among a plurality of data streams*” because Shao-028 teaches that the VTA Router (the “*video router*”) “may also be configured to ... provide bandwidth allocation coordination among multiple data bitstreams, and/or even provide dynamic bandwidth re-allocation.” Ex.1005, 13:10-21. Ex.1003, ¶170.

Accordingly, Shao-028 teaches or suggests elements [3.0], [8.0], and [13.0].

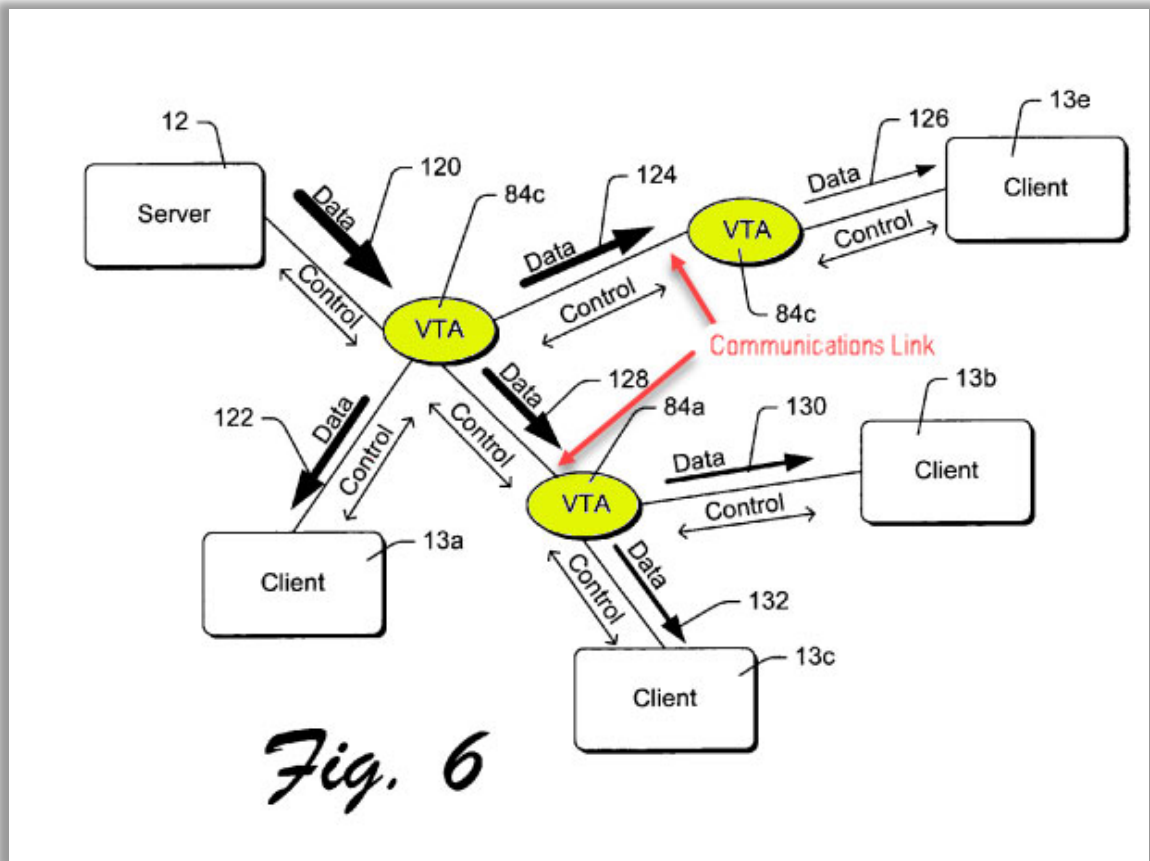
14. Dependent Claims 5, 10, and 15: Transmitting the layered video stream to another video router over a communications link

- a. [5.0] The video router of claim 1, further comprising: a communications link connecting the video router with at least a second video router, wherein the layered video data stream is transmitted over the**

communications link between the video router and the second video router.

- b. [10.0] The method of claim 6, wherein the layered video data stream is received from another video router.**
- c. [15.0] The video router of claim 11, further comprising: a communications link connecting the video router with at least a second video router, wherein the layered video data stream is transmitted over the communications link between the video router and the second video router.**

For the same reasons addressed above with respect to claim limitation [1.6], [6.4], and [11.7], Shao-028 discloses “*transmit[ting] the layered video data stream,*” which would be over “*[a] communications link between the video router and [a] second video router*” because Shao-028 teaches using “the link state between the VTA and its next upstream VTA” and “all [of a VTA’s] next downstream VTAs” to determine the resource allocation policy, e.g., (Capacity, Requirement) and depicted in Fig. 6 (reproduced below). Ex.1005, 13:39-41, 44-46. In particular, the example in Fig. 6 depicts “*a communications link between*” VTA Router 84c (“*the video router*”) and VTA 84a (“*a second video router*”). “[E]stablishing a communications link between the computers” in Shao-028’s system. Ex.1005, 8:10-11, *see also* Ex.1005, 8:1-4. Ex.1003, ¶173.



Ex.1005, Fig. 6 (annotated).

Accordingly, Shao-028 teaches or suggests elements [5.0], [10.0], and [15.0].

B. Ground 2: Shao-028 in view of Shao-423 renders obvious claims 1-3, 5-8, 10-13, and 15

As demonstrated above, Shao-028 teaches or suggests each element of claims 1-3, 5-8, 10-13, and 15. For the reasons discussed below, to the extent one asserts certain claims elements are not taught or suggested by Shao-028, those elements would have been obvious based on Shao-423.

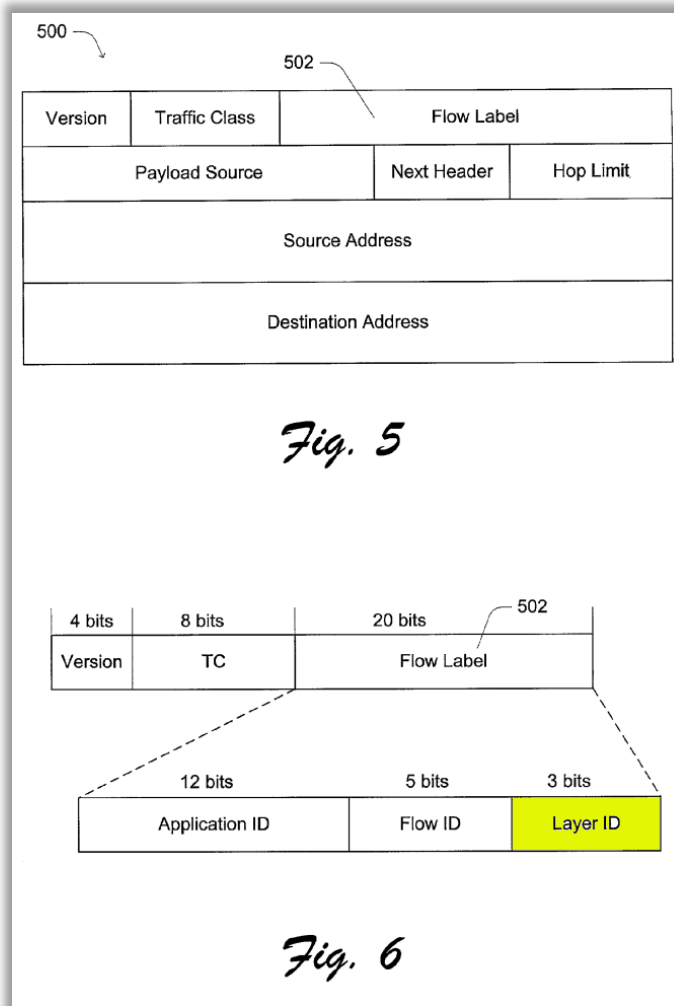
1. The Combination of Shao-028 and Shao-423

To the extent one asserts that Shao-028 does not teach or suggest a “*layer identifier*,” it would have been obvious to include that functionality in data packets using the scalable video transmission scheme of Shao-028 in view of Shao-423, as demonstrated below. Initially, Shao-028 and Shao-423 both teach use of Internet Protocol version 6 (IPv6) and MPEG-4 for their video transmission methods over the Internet. Specifically, Shao-028 teaches an implementation using “MPEG-4 video encoding/decoding source code and Ipv6 protocol stack source codes.” And, Shao-423 teaches a “general transport framework architecture ... suitable for use by ... multimedia applications ... using MPEG-4” and further provides “an IPv6 header ... as an example to explain how to define such an identifier.” Ex.1005, 14:1-5. Ex.1006, [0102].

Shao-423 expressly discloses “*layer identifier*” as part of an exemplary IPv6 header that would include a “flow label field.” For example, Shao-028 explains that although a “Flow label field 502 has not been defined by IETF,” Shao-423 provides an example of how it can be used as an “Application-Flow-Layer Identifier.” Shao-423 explains that “[a]n application-flow-layer identifier is used in a packet to identify the information within the packet. This Application-Flow-Layer Identifier can be used by ARCs and MPAs.” Ex.1006, [102]. Shao-423 describes ARCs and

MPAs as “application-aware resource controller[s]” and “media processing agent[s],” respectively. Ex.1006, [0050]. Ex.1003, ¶58.

Shao-423 discloses that Figure 5 “illustrates an exemplary header 500. Here, an IPv6 header is provided as an example to explain how to define such an identifier.” Ex.1006, [0102]. Shao-423 also explains that Figure 6 “further illustrates one potential specification of the application-flow-layer identifier within the flow label field 502. Here, the 20-bit flow label field is specified as further including a 12-bit application identifier, a 5-bit flow identifier and **a 3-bit layer identifier.**” Ex.1006, [0103] (emphasis added). Figures 5 and 6 of Shao-423 are depicted below:



Ex.1006, Figures 5 and 6 (annotated). Ex.1003, ¶59.

In the proposed combination, the data packets used in the scalable video transmission scheme of Shao-028 would be modified based on the teachings of Shao-423, and thus the IPv6 header of Shao-028 would additionally include a flow label field taught in Shao-423 comprising “layer ID” (“*layer identifier*”) as depicted above. Ex.1003, ¶60.

Shao-028 and Shao-423 are analogous art to the 372 Patent because each is in the field of “network management,” and specifically, “management of data packets to support multicasting.” *See, e.g.*, Ex.1001, 1:20-23; *see also* Ex.1005, 1:3-12 (This invention relates generally to data communications and, more particularly, to prioritization methods and arrangements for selectively transmitting object-based data based on data content in response to dynamically changing network conditions and/or client preferences.”); Ex.1006, [0002] (“The present invention relates generally to data communications, and more particularly to improved methods and arrangements that employ novel differentiation techniques for adaptive multimedia unicast and multicast communications.”). Indeed, both Shao-028 and Shao-423 disclose the use of IPv6 for packet transmissions. Ex.1005, 14:1-5, Ex. 1106, [0102]. Ex.1003, ¶61.

Moreover, Shao-028 and Shao-423 are reasonably pertinent to the problem addressed by the 372 Patent, i.e., the problems associated with a bandwidth bottleneck and congestion or that slowing down data may not be an option for all types of data streams sent over the Internet. Ex.1001, 1:55-2:20. Ex.1005, Abstract, 1:53-63. Ex.1006, Abstract, [0004], [0008]-[0009]. Furthermore, Shao-028 and Shao-423 relate to the same technical field and address the same problem, i.e., support or otherwise enhance the Quality of Service (QoS) of video data streams sent over the Internet. For example, Shao-028 explains that “methods and

arrangements are provided to **significantly increase the Quality of Service (QoS)** provided by packet-switched networks [*e.g.*, the Internet] **during the transmission of time critical data streams**” such as “multimedia (*e.g.*, video, audio, etc.) stream transmissions.” Ex.1005, 2:1-7 (emphasis added), 1:51-52, 1:59-61; *see also* 1:64-67. And Shao-423 describes its solution to the same common problem includes “improved methods and arrangements implement differentiation techniques for adaptive multimedia unicast and multicast communications over heterogeneous user- and network environments,” Ex.1006, [0011], for supporting QoS (*e.g.*, “**a QoS enabled application,**” “**an application-aware QoS control layer,**” “**a QoS packet scheduler layer**”) over Internet Protocol (IP) because “multimedia applications/devices would benefit from ... (QoS) support/guarantees from the interconnecting network(s).” Ex.1006, [0058], [0003]. Because they address the same problem of enhancing or otherwise supporting QoS over the Internet, it would have been obvious for data packets using the scalable video transmission scheme of Shao-028 to additionally include the teachings of Shao-423 comprising a flow label field (including “*layer identifier*”). Indeed, a POSITA would have understood that in the system of Shao-028, a mechanism to identify each layer would be necessary to properly decode and combine each layer. Although Shao-028 does not appear to expressly provide the implementation details of such a mechanism, a POSITA would

have naturally looked to Shao-423 for such implementation details, as explained herein. Ex.1003, ¶62.

It would also have been obvious to combine Shao-028 and Shao-423 so that data packets using the scalable video transmission scheme of Shao-028 would be modified to include the teachings related to Shao-423's flow label field (including “*layer identifier*”) because to do so would have been the arrangement of old elements (a packet-switched network comprising routers, applications, and among other things, use of MPEG4 video data stream, flow label fields, and IPv6 transmission protocol) with each performing the same function it has been known to perform (prioritizing and packetizing video content for transmission over the Internet) and yielding no more than what one would expect from such an arrangement (an improved technique for distributing multimedia content over heterogeneous user- and network-environments using flow label in IPv6 packet headers) , as Shao-423 demonstrates. *See* Ex.1005, Abstract, 1:8-12, 14:1-5. Ex.1006, [0011], [0102]. Additionally, a POSITA would have been motivated to use a flow label field, as taught in Shao-423 in view of its benefits. *See, e.g.,* Ex.1009, [0012] (“Flow labels are used in conjunction with a source identifier or source address and destination identifier or destination address to form a triplet **that enables efficient flow classification. . . . Without the flow label, information identifying the flow would need to be extracted from higher-layer headers,** e.g. TCP (transport control

protocol) and UDP (user datagram protocol) headers. When cryptographic methods are used, such as IPSec (IP security protocol), higher-layer headers may not be available in plaintext, thereby removing the ability to identify the flow using the higher-layer headers); *see also* Ex.1011, 1:37-57 (describing improvements such as flow labeling capability: “**To support real-time traffic such as video conference, IPv6 has ‘Flow Label’.** Using flow label, router can know which end-to-end flow a packet belongs to, and then find out the packet which belongs to real-time traffic.”) Ex.1003, ¶63.

It would have also been obvious to modify the data packets using the scalable video transmission scheme of Shao-028 to additionally include the teachings of Shao-423’s IPv6 header with the flow label field (including “*layer identifier*” because a POSITA would have been motivated to make such a combination based on the teachings of Raisanen, Garafolo, and RFC2460, which individually reflect a POSITA’s understanding of the benefits for using a flow label field. Ex.1003, ¶64.

For example, Raisanen underscores the importance of the flow label field and Garafolo describes how the flow label field is used by a router. Ex.1009, [0012] (“Without the flow label, information identifying the flow would need to be extracted from higher-layer headers, e.g. TCP (transport control protocol) and UDP (user datagram protocol) headers. When cryptographic methods are used, such as IPSec (IP security protocol), higher-layer headers may not be available in plaintext,

thereby removing the ability to identify the flow using the higher-layer headers.”); *see also* Ex.1011, 1:37-57 (describing improvements such as flow labeling capability: “To support real-time traffic such as video conference, IPv6 has ‘Flow Label’. Using flow label, router can know which end-to-end flow a packet belongs to, and then find out the packet which belongs to real-time traffic.”). Additionally, Raisanen recognizes several benefits of adding flow labels to data packets. A first benefit of adding flow labels to data packets is that it would “identify a traffic flow to which a data packet belongs or to give a data packet some flow-specific treatment,” for example, it would enable a network node to “prioritise the routing of the node so that the QoS defined is maintained for the data flow.” Ex.1009, [0010]. A second benefit of adding flow labels to data packets is that “only data in the basic IP header” is used, and higher-layer headers are not utilized Ex.1009, [0012]. This would save protocol overhead and thereby consume less network resources. Furthermore, as early as 1998, even the governing Internet Engineering Task Force (IETF) recognized the benefits of using “flow label.” RFC2460¹³ (Ex.1012) describes using flow labels in packet headers to signal IPv6 routers to provide “special handling” for certain types of data packets, e.g., packets associated with ““real-time” service,”” such as distance learning or multimedia applications.

¹³ This document is available online at <https://datatracker.ietf.org/doc/html/rfc2460> (last accessed August 4, 2024).

Ex.1012, 2. Thus, RFC2460, published six years before the earliest priority date of the 372 Patent reflects the POSITA's understanding of the benefits of a flow label field and provides motivation to combine Shao-028 and Shao-423 to include a flow label field in the IPv6 packet header to support real-time services. Ex.1003, ¶64.

A POSITA would have been motivated at least by these disclosures to use a flow label as part of an IPv6 header, *e.g.*, by additionally including in the IPv6 header of Shao-028 the teachings of Shao-423, which includes a flow label comprising a “*layer identifier*” because it would permit packets to be prioritized with respect to forwarding and dropping as needed to provide the QoS-based approach called differentiated services (*i.e.*, Diffserv) supported by modern versions of the Internet Protocol. Indeed, both Shao-028 and Shao-423 anticipate the common need for providing differentiated services for multimedia communications over future versions of the Internet. “Future generations of the Internet Protocol will provide differential service, whereby data packets will be treated as having a specified priority.” Ex.1005, 8:12-14. “To support QoS in the Internet, the governing Internet Engineering Task Force (IETF), which is the main standards organization for the Internet, has defined two architectures that are expected to be implemented in the future, namely an Integrated Services or Intserv, and a Differentiated Services or DiffServ.” Ex.1006, [0005]. Ex.1003, ¶65.

Moreover, the combination of Shao-028 and Shao-423 would have been obvious to try. A POSITA would have known there were only a finite number of identified, predictable solutions to the bandwidth bottleneck problem address by Shao-028 and Shao-423. Moreover, a POSITA would have had a reasonable expectation of success in making the combination because it would be a simple substitution well within the skill of a POSITA. For example, modifying the data packet header in Shao-028 based on the teachings of the IPv6 header proposed in Shao-423 to include a flow label field would be akin to adding to a first header type fields from a second header type to obtain the predictable result of generating a resulting header having a different format which still complies with IPv6. In the example of Shao-423, the “layer identifier” is a 3-bit field. Shao-423 further recognizes that “Flow label field 502 has not been defined by IETF” and provides an example of how it can be used as an “Application-Flow-Layer Identifier.” Because the header proposed in Shao-423 still uses the IPv6 protocol, a POSITA would have recognized that modifying the scheme in Shao-028 to include teachings from Shao-423’s IPv6 header would not change the principle of operation of the video transmission scheme proposed in Shao-028. A POSITA would therefore have had good reason to pursue these known options and would have the ability to make the combination cited above. Ex.1003, ¶66.

Additionally, at the time of the claimed invention, it was within the general knowledge of a POSITA that IPv4 and IPv6 presented a finite number (*i.e.*, two) transmission protocol options for packets exchanged over the Internet. For example, both Shao-028 and Shao-423 teach specifying the QoS class of each data packet using a type of service (TOS) byte within the IPv4 header or a traffic class byte within the IPv6 header (IPH) of the data packet. Ex.1005, 8:20-23, Ex.1006, [0007]. Therefore, “to provide an improved multimedia communication environment,” (Ex.1006, [0009])—*e.g.*, better quality video data with the same bandwidth—which is one goal of Shao-423, a POSITA would have found it obvious to try adding to the standard IPv6 packet header in Shao-028 fields from the exemplary IPv6 packet header taught in Shao-423, and in doing so, a POSITA would have had a reasonable expectation of success in view of Shao-423’s teachings that packets having its exemplary IPv6 header (comprising the “*layer identifier*” included in the flow label field) “can be used” by ARCs and MPAs, which are network components providing similar functionality as routers. Ex.1006, [0050], [0053]. Ex.1003, ¶67.

Finally, Shao-028 and Shao-423 both share common inventors and the same assignee, and Shao-423 incorporates by reference Shao-028, and that is an additional reason that a POSITA would have looked to the teachings of Shao-423 when considering Shao-028. Ex.1003, ¶68. *See, e.g., Abbot Vascular, Inc. v. Flexstent*, IPR2019-00882, Paper 48, 28-29 (Oct. 2, 2020); *Black v. CE Soir Lingerie Co.*, No.

2:06-CV-544, 2008 WL 3852722, at *14 (E.D. Tex. Aug. 15, 2008) aff'd, 319 F. App'x 901 (Fed. Cir. 2009) (“strong motivation to combine” prior art “patented by the same inventor” and that “reference each other”).

2. Layer Identifier of Packets

- a. [1.9] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.
- b. [6.7] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.
- c. [11.10] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.

To the extent PO contends that Shao-028 does not expressly disclose a “*layer identifier*” in the IP header of its data packets, this element is taught by Shao-028 as modified by the teachings of Shao-423 because Shao-423 discloses a 3-bit “*layer identifier*” included within a “flow label field” in the exemplary IPv6 header of a data packet, and it would have been obvious for a POSITA that data packets used in the scalable video transmission scheme of Shao-028 would be modified based on the teachings of Shao-423, and thus the IPv6 header of Shao-028 would additionally include a flow label field taught in Shao-423 comprising “layer ID” (“*layer identifier*”) for the reasons explained above. See §VIII.B.1. Shao-423 recognizes that at the time of its invention, “Flow label field 502 has not been defined by IETF”

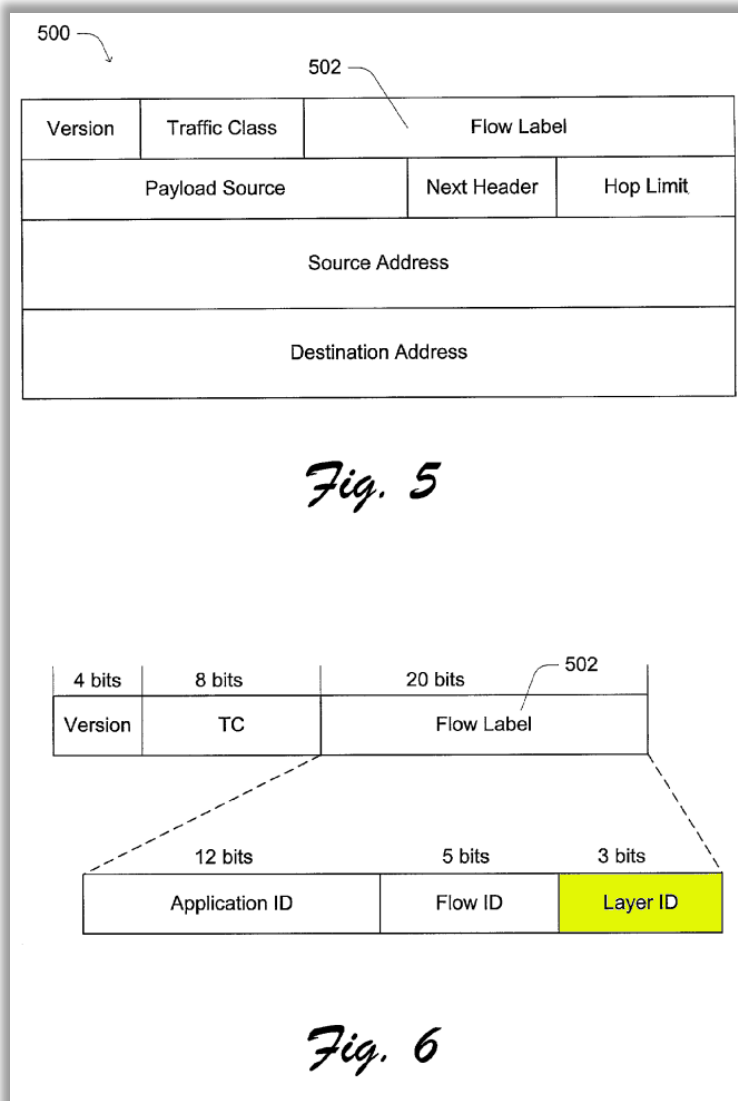
and provides an example of how it can be used as an “Application-Flow-Layer Identifier.” Ex.1003, ¶161.

1.5 Application-Flow-Layer Identifiers

An application-flow-layer identifier is used in a packet to identify the information within the packet. This Application-Flow-Layer Identifier can be used by ARCs and MPAs. FIG. 5 illustrates an exemplary header **500**. Here, **an IPv6 header is provided as an example to explain how to define such an identifier.** Of particular interest in this example, is the (20-bit) flow label field **502**. **Flow label field 502 has not been defined by IETF and as such is used herein as an Application-Flow-Layer Identifier.**

FIG. 6 further illustrates one potential specification of the application-flow-layer identifier within the flow label field **502**. **Here, the 20-bit flow label field is specified as further including** a 12-bit application identifier, a 5-bit flow identifier and **a 3-bit layer identifier.**

Ex.1006, ¶ [0101]-[0106]. Figs. 5 and 6 (reproduced below) of Shao-423 depict the “application layer identifier” (the “*layer identifier*”) with respect to the “Flow Label” field in the IPv6 packet header.



Ex.1006, Figs. 5 and 6 (annotated). Ex.1003, ¶¶161-162.

Accordingly, Shao-028 in view of Shao-423 renders obvious elements [1.9], [6.7], and [11.10].

IX. THE BOARD SHOULD NOT EXERCISE ITS DISCRETION AND DENY INSTITUTION

A. The Board Should Not Deny Institution Under 35 U.S.C. § 325(d)

Denial under § 325(d) is not warranted because the challenges presented in this Petition are neither cumulative nor redundant to the prosecution of the 372 Patent (or related patents), as neither Shao-028 nor Shao-423 were cited or considered by the Examiner during prosecution of the 372 Patent. *Sony v. MZ Audio Scis., LLC*, IPR2022-01544, Paper No. 12, *7 (§325(d) discretion improper where “Examiner did not consider the specific combination of references asserted”). Moreover, the Examiner also did not have the benefit of Dr. Chatterjee’s detailed expert testimony and the further evidence of record. Finally, the 372 Patent has not been previously challenged in an IPR.

B. The Board Should Not Deny Institution Under 35 U.S.C. § 314(a)

1. Factor 1: No Evidence Regarding a Stay

Factor 1, for example, is **neutral** because no request for stay has been filed. *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 15 at 12 (May 13, 2020) (informative) (“*Fintiv*”) (explaining that factor 1 generally “does not weigh for or against discretionary denial” when neither party has requested a stay); *Amazon Web Services et al. v. Zentian Ltd.*, IPR2023-01194, Paper 10 at 11 (Jan. 10, 2024)) (“As to factor 1, there is no evidence as to whether there will be a stay in the parallel case, so we regard this factor as neutral.”)

2. Factor 2: Parallel Proceeding Trial Date

Regarding factor 2, the Court has currently set the trial date for August 25, 2025, although historically the Eastern District of Texas has seen a lot of movement in scheduled trial dates. And here, a final determination by the Board in this proceeding is likely to be issued approximately six months after trial even if it were to stay the same, which remains in close proximity to trial. This factor is therefore **neutral**. IPR2021-01492, Paper 12 at 9–16 (March 21, 2022) (granting institution even when the co-pending trial date was scheduled six months before the final written decision deadline). *Western Digital Corporation v. Kuster*, 2021 WL 627719, *4 (February 17, 2021) (factor is neutral given “proximity” of trial 3½ months before final written decision).

3. Factor 3: Parallel Proceeding Investment

Factor 3 weighs against discretionary denial. In the related litigation, the Claim Construction hearing is set for October 16, 2024 based on the parties’ agreement, and the investment by the parties to date has been relatively minimal.

4. Factor 4: Overlapping Issues with the Parallel Proceeding

In the interest of efficiency, Petitioner stipulates that, if instituted, it will not pursue in the parallel district court proceeding the same grounds as in the Petition or any grounds that could have reasonably been raised therein, consistent with a *Sotera* stipulation. Given Director Vidal’s guidance on *Fintiv*, the Board should decline to

exercise its discretion to deny institution. *See Director's Interim Procedure for Discretionary Denials*, pp. 7-8 (June 21, 2022). In addition, Cisco challenges a number of claims not at issue in the parallel proceeding, including claims 3, 5, 8, 10, 13, and 15. Factor 4, therefore, strongly **favours institution**

5. Factor 5: Overlapping Parties

Factor 5 is neutral. Cisco is a defendant in the related litigation. As *Fintiv* demonstrates, this factor should play a role only where a Petitioner is unrelated to a defendant in a district court proceeding. *See Fintiv*, IPR2020-00019, Paper 11 at 13–14 (PTAB Mar. 20, 2020). Accordingly, the Board should find this factor to be **neutral**.

6. Factor 6: Strength of Petition and Other Considerations

Other circumstances weigh against discretionary denial. Here, the merits of the Petition are particularly compelling—for example, Shao-028 (and Shao-423) is a strikingly similar disclosure to that of the 372 Patent, is directed at the same problem and proposes the same solutions as the 372 Patent and discloses nearly identical functionality as the claimed “*video router / scalable video coding router*.” The evidence presented, if unrebutted in trial, would plainly lead to a conclusion that one or more claims are unpatentable by a preponderance of the evidence.

X. CONCLUSION

Claims 1-3, 5-8, 10-13, and 15 of the 372 Patent are unpatentable for the reasons demonstrated above.

Dated: September 5, 2024

Respectfully Submitted,

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CERTIFICATE OF COMPLIANCE

I hereby certify that this brief complies with the type-volume limitations of 37 C.F.R. § 42.24, because it contains 13,959 words (as determined by the Microsoft Word word-processing system used to prepare the brief and including annotated figures), excluding the parts of the brief exempted by 37 C.F.R. § 42.24.

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CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. § 42.6(e), I hereby certify that on this 5th day of September, 2024, I caused to be served a true and correct copy of the foregoing and any accompanying exhibits by priority mail on the following:

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CLAIM LISTING

Claim 1
[1.0] A video router, comprising:
[1.1] a memory; and
[1.2] a processor, wherein the processor executes instructions stored in the memory to cause the video router to:
[1.3] receive a layered video data stream including a base layer and a set of enhancement layers,
[1.4] identify bandwidth-limited conditions of an internet protocol network between the video router and a plurality of video receivers,
[1.5] forward the base layer from the video router to at least two of the plurality of video receivers via the internet protocol network, and
[1.6] selectively forward one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the plurality of video receivers through the internet protocol network based upon the identified bandwidth-limited conditions, and
[1.7] wherein the video router transmits the layered video data stream according to an internet protocol;
[1.8] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and
[1.9] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.
Claim 2
[2.0] The video router of claim 1, wherein the video router further selectively forwards the one or more of the set of enhancement layers based on video processing capabilities of the video receiver.
Claim 3
[3] The video router of claim 1, wherein the video router divides available bandwidth among a plurality of data streams, and wherein the video router prioritizes forwarding of the set of enhancement layers.
Claim 5
[5] The video router of claim 1, further comprising: a communications link connecting the video router with at least a second video router, wherein the layered video data stream is transmitted over the communications link between the video router and the second video router.
Claim 6
[6.0] A method for transmitting video signals, the method comprising:

[6.1] receiving a layered video data stream comprising a base layer and a set of enhancement layers;
[6.2] identifying bandwidth-limited conditions of an internet protocol network between a video router and a plurality of video receivers;
[6.3] forwarding the base layer to at least two of the plurality of video receivers via the internet protocol network; and
[6.4] selectively forwarding one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the plurality of video receivers through the internet protocol network based upon the identified bandwidth-limited conditions;
[6.5] wherein the layered video data stream is transmitted according to an internet protocol; and
[6.6] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and
[6.7] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.
Claim 7
[7.0] The method of claim 6, wherein the selectively forwarding step further comprises: selectively forwarding the one or more of the set of enhancement layers based on video processing capabilities of the video receiver.
Claim 8
[8.0] The method of claim 6, further comprising: dividing available bandwidth among a plurality of data streams; and prioritizing the set of enhancement layers for the selectively forwarding step.
Claim 10
[10] The method of claim 6, wherein the layered video data stream is received from another video router.
Claim 11
[11.0] A scalable video coding router, comprising:
[11.1] a memory; and
[11.2] a processor, wherein the processor executes instructions stored in the memory to cause the scalable video coding router to:
[11.3] receive a layered video data stream that comprises a base layer and a set of enhancement layers,
[11.4] identify bandwidth-limited conditions of an internet protocol network between the video router and a set of video receivers, and

[11.5] forward the base layer from the video router to at least two of the set of video receivers;
[11.6] wherein the scalable video coding router forwards all of the set of enhancement layers to at least two of the video receivers in the set of video receivers with bandwidth-sufficient conditions;
[11.7] wherein the scalable video coding router selectively forwards one or more of the set of enhancement layers, but fewer than all of the set of enhancement layers, to at least two of the remaining video receivers in the set of video receivers based upon the identified bandwidth-limited conditions;
[11.8] wherein the layered video data stream is transmitted according to an internet protocol; and
[11.9] wherein each layer of the layered video data stream comprises data packets, each of which is encoded with a sequence number and
[11.10] a layer identifier, and wherein the layer identifier for each data packet is based upon a layer to which the packet belongs.
Claim 12
[12.0] The video router of claim 11, wherein the video router further selectively forwards the one or more of the set of enhancement layers based on video processing capabilities of each of the set of video receivers.
Claim 13
[13] The video router of claim 11, wherein the video router divides available bandwidth among a plurality of data streams, and wherein the video router prioritizes forwarding of the set of enhancement layers.
Claim 15
[15] The video router of claim 11, further comprising: a communications link connecting the video router with at least a second video router, wherein the layered video data stream is transmitted over the communications link between the video router and the second video router.