

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

JUNIPER NETWORKS, INC.,
Petitioner,

v.

SMART PATH CONNECTIONS, LLC,
Patent Owner.

IPR2022-00240
Patent 7,961,755 B2

Before JAMESON LEE, DAVID C. McKONE, and
STEVEN M. AMUNDSON, *Administrative Patent Judges*.

LEE, *Administrative Patent Judge*.

JUDGMENT
Final Written Decision
Determining All Challenged Claims Unpatentable
35 U.S.C. § 318(a)

I. INTRODUCTION

We instituted an *inter partes* review of claims 1–20 (“challenged claims”) of U.S. Patent No. 7,961,755 B2 (Ex. 1001, “the ’755 patent”) owned by Smart Path Connections, LLC (“Patent Owner”). Paper 10 (“Decision to Institute” or “Inst. Dec.”). We have authority to conduct this *inter partes* review under 35 U.S.C. § 6. This Final Written Decision is

issued pursuant to 35 U.S.C. § 318(a) and 37 C.F.R. § 42.73. We determine that Juniper Networks Inc. (“Petitioner”) has proven by a preponderance of the evidence that each of claims 1–20 of the ’755 patent is unpatentable.

A. Background

Petitioner filed a Petition requesting *inter partes* review of claims 1–20 of the ’755 patent. Paper 1 (“Pet”). Patent Owner filed a Preliminary Response. Paper 6. The Decision to Institute was entered on May 25, 2022. Inst. Dec. Thereafter, Patent Owner filed a Response. Paper 20 (“PO Resp.”). Petitioner filed a Reply. Paper 25. Patent Owner filed a Sur-Reply. Paper 34. Oral hearing was held on March 27, 2023. A copy of the hearing transcript has been entered into the record. Paper 40 (“Tr.”).

B. Real Parties in Interest

Petitioner states that its real party in interest is Juniper Networks, Inc. Pet. xi. Patent Owner states that its real party in interest is Smart Path Connections, LLC. Paper 4, 1.

C. Related Matters

Petitioner identifies the following terminated matters as related litigation involving the ’755 patent: *Smart Path Connections, LLC v. Juniper Networks, Inc.*, No. 6:21-cv-00328-ADA (W.D. Tex.);¹ *Smart Path Connections, LLC v. Adtran, Inc.*, No. 6:21-cv-00326-ADA (W.D. Tex.). Pet. xi. Both parties identify two *inter partes* review proceedings, not involving the ’755 patent, as related matters: IPR2021-01170 (Patent No. 7,463,580 B2) and IPR2021-01356 (Patent No. 7,697,525 B2). Pet. xi;

¹ Patent Owner dismissed its action against Petitioner. Ex. 1030.

Paper 4, 1. Patent Owner additionally identifies IPR2021-01551 (Patent No. 7,551,559 B2) as a related matter. Paper 4, 1.²

D. The '755 Patent (Ex. 1001)

The '755 patent provides methods for transport of time-domain-multiplexed (“TDM”) signals over a packet network, based on adaptive encapsulation of the TDM signal payloads. Ex. 1001, 4:39–42. “An integrated transport device (ITD) receives input signals from one or more TDM sources, typically via SONET, SDH, or PDH input lines, and chooses the encapsulation scheme to be applied to each signal depending on the type of data that it carries.”³ *Id.* at 4:42–46. Although SONET and SDH were originally designed for carrying synchronous data, such as voice, legacy TDM networks and trunks are now commonly used for carrying non-synchronous packet data services as well. *Id.* at 5:17–20. TDM signals carrying packet data are encapsulated using a scheme that conserves bandwidth, by suppressing idle bytes in the payload. *Id.* at 4:49–52. When SONET signals received by an ITD from a TDM source include Virtual Tributaries (“VTs”), the ITD may suppress unused VTs. *Id.* at 16:63–66.

² We did not institute review in IPR2021-01170 and IPR2021-01551. IPR2021-01170, Paper 10; IPR2021-01551, Paper 7. We instituted review in IPR2021-01356 but determined in a final written decision that no claim has been proven unpatentable. IPR2021-01356, Paper 27.

³ “SONET” is abbreviation for Synchronous Optical Network and represents “a group of standards that define a hierarchical set of transmission rates and transmission formats for carrying high-speed, time-domain-multiplexed (TDM) digital signals.” Ex. 1001, 1:12–15. “SDH” is a parallel set of standards known as Synchronous Digital Hierarchy and is widely used in Europe. *Id.* at 1:25–28. “PDH” stands for plesiochronous digital hierarchy. *Id.* at 1:15–18.

Figure 11 is illustrative and is reproduced below:

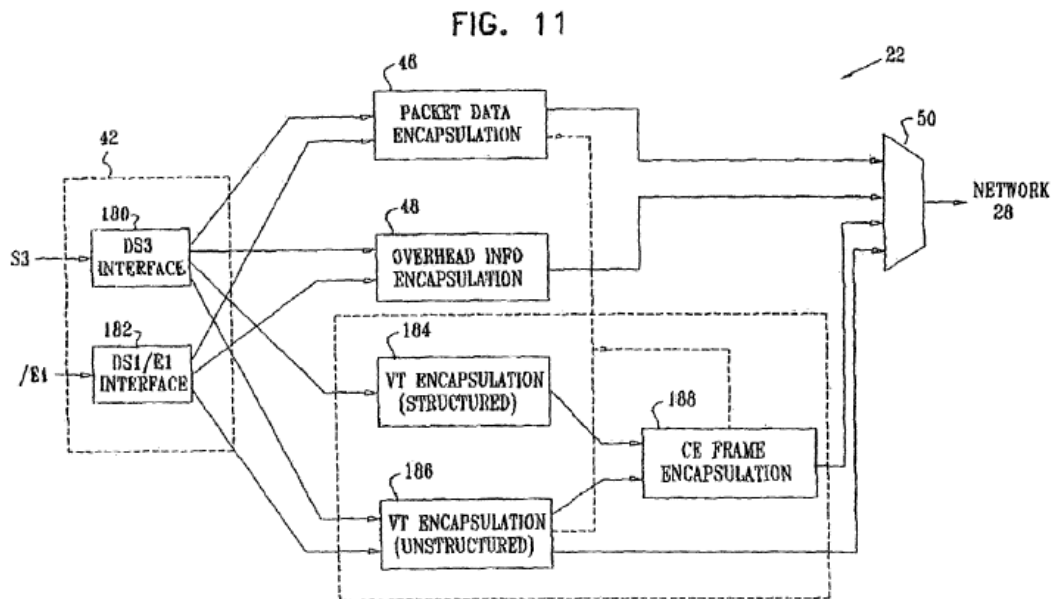


Figure 11 is a block diagram showing details of an ITD as applied to encapsulate PDH signals. *Id.* at 17:22–24. However, the '755 patent describes that the elements of the ITD may be modified to also execute the described embodiment for SONET such that “the ITD encapsulates and transports both SONET/SDH and PDH signals.” *Id.* at 17:24–28.

Specifically, “[f]or each TDM input signal that it receives, TDM interface 42 selects an appropriate encapsulation scheme to apply, depending on the type of the signal payload.” *Id.* at 10:33–35. The '755 patent describes:

If the payload comprises non-synchronous data, such as IP packets, ATM cells, Frame Relay frames, PPP frames or HDLC frames (all of which are referred to generically herein as “packet data”), interface 42 passes the data to a packet data encapsulation module 46. This module also receives the packet data input to ITD 22 via packet interface 40. Module 46 encapsulates the data in a manner that is not dependent on the synchronization of the input data.

Id. at 10:45–53. The '755 patent further describes:

When DS-3 interface 180 receives a structured signal carrying a synchronous data payload, it passes the data to a structured VT encapsulation module 184. This module maps the components of the payload to virtual tributaries (VTs) of a STS-1 SONET frame. VT configurations that can be used for this purpose are described in the Background of the Invention. In order to conserve bandwidth on network 28, module 184 suppresses unused VTs, using the methods described in the above-mentioned Internet draft by Pate et al., or in U.S. patent application Ser. No. 09/978,342, for example. A CE frame encapsulation module 188 completes the encapsulation of the payload data in output packets, in such a way as to preserve synchronization of the data sent to egress ITD 24. Module 188 adds transport headers to the output packets, typically as specified by Malis et al.

When interface 182 receives DS-1 or E1 signals carrying synchronous payload data, it passes fine payload data to an unstructured VT encapsulation module 186. This module maps the DS-1 or E1 signals into VT1.5 or VT2 containers, respectively. It likewise maps unstructured DS-3 signals into STS-1 frames. (Equivalently, in emulation of SDH networks, module 186 may map DS-1, E1 and DS-3 signals into VC-1, VC-2 and VC-3 containers, respectively.) Module 186 may map these containers or frames directly into output packets for transmission over network 28, typically as specified by Pate et al. Alternatively, the VT (or VC) containers may be passed to CE frame encapsulation module 188, which maps the containers into full STS-1 frames and encapsulates the frames in output packets, typically as specified by Malis et al. In either case, the output packets are then transmitted via multiplexer 50 over network 28.

Id. at 18:28–58.

The '755 patent refers to PPP (Point-to-Point Protocol) frames and HDLC (High-level Data Link Control) frames as examples of non-synchronous data generally referenced as “packet data.” *Id.* at 10:45–53. Specifically, the '755 patent describes:

For each TDM input signal it receives, TDM interface 42 selects an appropriate encapsulation scheme to apply, depending on the type of the signal payload:

If the payload comprises synchronous data, such as voice data, interface 42 passes the data to a CE encapsulation module 44. This module encapsulates the payload data in such a way as to preserve synchronization of the data sent to egress ITD 24. In the present example, module 44 uses the encapsulation scheme specified by Malis et al., in the above-mentioned Internet draft, although other synchronization-preserving encapsulation schemes may be used, as well.

If the payload comprises *non-synchronous data, such as* IP packets, ATM cells, Frame Relay frames, *PPP frames or HDLC frames*, (all of which are referred to generically herein as “packet data”), interface 42 passes the data to a packet data encapsulation module 46. This module also receives the packet data input to ITD 22 via packet interface 40. Module 46 encapsulates data in a manner that is not dependent on the synchronization of the input data.

Id. at 10:33–53 (emphases added). Additional disclosure in the specification of the ’755 patent also identify PPP and HDLC frames as non-synchronous data. For instance, the ’755 patent describes:

Typically, the synchronous data include voice data, while the non-synchronous data include at least one data type selected from a group of data types consisting of Asynchronous Transfer Mode (ATM) cells, Internet Protocol (IP) packets, Frame Relay (FR) frames, High-level Data Link Control (HDLC) frames, Point-to-Point Protocol (PPP) frames, Ethernet frames and Generic Framing Procedure (GFP) frames.

Id. at 5:37–43. Similarly, the ’755 patent further describes:

At least some of the payload data typically comprises synchronous payloads, such as voice signals transmitted over DS1 lines of a PDH network. Other payload data received by TDM interface 42 may comprise packet data carried over TDM

networks, such as Frame Relay, PPP, HDLC or Generic Framing Procedure (GFP) frames carried over DS1 lines, as well as ATM cells and IP packets transported over SONET lines in the TDM network.

Id. at 10:20–27.

Of challenged claims 1–20, only claim 1 is independent. Claim 1 is reproduced below, with bracketed captions added to correspond to the labeling used by Petitioner:

[1.Pre] A method for data communications, comprising:

[1.1] receiving a time-division-multiplexed (TDM) input signal carrying a payload comprising data in at least one Synchronous Optical Network (SONET) frame having a plurality of virtual tributaries (VT's) including at least one unused VT;

[1.2] determining whether the data comprise synchronous or non-synchronous data; and

[1.3] selecting a first encapsulation scheme of the data comprise synchronous data, and a second encapsulation scheme if the data comprise non-synchronous data, wherein the selected encapsulation scheme includes suppression of the at least one unused VT; and

[1.4] encapsulating the data for transmission over a packet-switched network in accordance with the selected encapsulation scheme.

Id. at 19:2–17.

E. Evidence Relied on by Petitioner and Patent Owner

Petitioner relies on the following evidence:⁴

References		Date	Exhibit
Choi	U.S. Pub. App. 2003/0035445 A1	Feb. 20, 2003	1008
Zelig	U.S. Pub. App. 2003/0012188 A1	Jan. 16, 2003	1010
Cao	U.S. Patent 7,266,110 B1	Sept. 4, 2007	1006
Lewin	U.S. Patent 6,829,252 B1	Dec. 7, 2004	1009
Cohen	WO 02/095958 A2	Nov. 28, 2002	1005
Malis	Malis et al., <i>SONET/SDH Circuit Emulation Service over MPLS (CEM) Encapsulation</i> , IEFT, 1–24 draft-malis-sonet-ces-mpls-05.txt (July 2001)	July 2001	1007

Petitioner relies on a Declaration (Ex. 1003) and a rebuttal Declaration (Ex. 1033) of Tal Lavian, Ph.D. Patent Owner relies on a Declaration of Robert Akl, D.Sc. (Ex. 2004).

F. Asserted Grounds of Unpatentability

Petitioner asserts that claims 1–20 of the '755 patent are unpatentable on the following grounds:

⁴ The '755 patent issued from Application 12/404,444, filed March 16, 2009, which is a continuation of Application 10/396,008, filed March 24, 2003, now U.S. Patent No. 7,515,605 B2. Ex. 1001, codes (21), (22), (63). Petitioner asserts that Application 10/396,008 does not have supporting disclosure for several limitations of independent claim 1. Pet. 6. In its Response, Patent Owner has not made any showing that it is entitled to the earlier filing date of Application 10/396,008. Thus, the date to which the '755 patent is entitled is its actual filing date, March 16, 2009.

Claim(s) Challenged	35 U.S.C. § ⁵	Reference(s)/Basis
1–20	103(a)	Cohen, Cao, Malis
1–20	103(a)	Choi, Lewin, Zelig

II. ANALYSIS

A. *The Burden of Proof on Challenged Patent Claims*

Petitioner must demonstrate by a preponderance of the evidence that the challenged claims are unpatentable. 35 U.S.C. § 316(e) (2018); 37 C.F.R. § 42.1(d) (2022). That burden never shifts to the patentee. *Dynamic Drinkware, LLC v. Nat’l Graphics, Inc.*, 800 F.3d 1375, 1378 (Fed. Cir. 2015).

B. *Level of Ordinary Skill in the Art*

Petitioner contends that a person of ordinary skill in the art at the time of the alleged invention “would have had a bachelor’s degree in electrical engineering, computer engineering, computer science, or a closely related field, and three to four years of experience in the design and development of telecommunication networks, systems, equipment, and components.” Pet. 7. (citing Ex. 1003 ¶¶ 88–95). Alternatively, Petitioner contends that a POSITA “would have [had] a Master’s degree or similar post-graduate work in electrical engineering, computer engineering, computer science, or a closely related field, and fewer years of design and development experience.” *Id.*

⁵ The Leahy-Smith America Invents Act, Pub. L. No. 112–29, 125 Stat. 284 (2011) (“AIA”), amended 35 U.S.C. §§ 102 and 103 effective March 16, 2013. Because the effective date of the ’755 patent is prior to March 16, 2013 (Ex. 1001, codes (22), (63)), we refer to the pre-AIA version of 35 U.S.C. § 103.

In its Preliminary Response, Patent Owner took no position on the level of ordinary skill in the art. Prelim. Resp. 16–17. In the Decision to Institute, we adopted Petitioner’s articulation of the level of ordinary skill in the art, and reasoned that Petitioner’s assertion is supported by the testimony of Dr. Lavian and appears consistent with the content of the applied prior art references, citing *Okajima v. Bourdeau*, 261 F.3d 1350, 1354–55 (Fed. Cir. 2001) (the applied prior art may reflect an appropriate level of skill).

Post institution, neither party objected to or disputed our adopted level of ordinary skill in the art. *See generally* Reply; PO Resp. 16. That level is consistent with what is reflected by the content of the applied prior art references. *Cf. Okajima v. Bourdeau*, 261 F.3d at 1354–55. Consequently, we adhere to the level of ordinary skill in the art as adopted in the Decision to Institute, i.e., Petitioner’s statement of the level of ordinary skill in the art.

C. Claim Construction

1. General Principles

We use the same claim construction standard that would be used to construe a claim in a civil action under 35 U.S.C. § 282(b), including construing the claim in accordance with the ordinary and customary meaning of such claim as understood by one of ordinary skill in the art and the prosecution history pertaining to the patent. 37 C.F.R. § 42.100(b). The claim construction standard set forth in *Phillips v. AWH Corp.*, 415 F.3d 1303 (Fed. Cir. 2005) (en banc) is applicable.

Claim terms are generally given their ordinary and customary meaning as would be understood by one with ordinary skill in the art in the context of the specification, the prosecution history, other claims, and extrinsic evidence including expert and inventor testimony, dictionaries, and learned treatises, although extrinsic evidence is less significant than the

intrinsic record. *Phillips*, 415 F.3d at 1312–17. Usually, the specification is dispositive, and it is the single best guide to the meaning of a disputed term. *Id.* at 1315.

The specification may reveal a special definition given to a claim term by the patentee, or the specification or prosecution history may reveal an intentional disclaimer or disavowal of claim scope by the inventor. *Id.* at 1316. If an inventor acts as his or her own lexicographer, the definition must be set forth in the specification with reasonable clarity, deliberateness, and precision. *Renishaw PLC v. Marposs Societa' per Azioni*, 158 F.3d 1243, 1249 (Fed. Cir. 1998). The disavowal, if any, can be effectuated by language in the specification or the prosecution history. *Poly-Am., L.P. v. API Indus., Inc.*, 839 F.3d 1131, 1136 (Fed. Cir. 2016).

Only those claim terms that are in controversy need to be construed, and only to the extent necessary to resolve the controversy. *Realtime Data, LLC v. Iancu*, 912 F.3d 1368 (Fed. Cir. 2019) (“The Board is required to construe ‘only those terms . . . that are in controversy, and only to the extent necessary to resolve the controversy.’” (quoting *Vivid Techs., Inc. v. Am. Sci. & Eng'g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999))).

Petitioner has not proposed a specific construction for any claim term, and states that no express construction is needed. Pet. 7. Further, Petitioner states that it understands each claim term according to its ordinary and customary meaning. *Id.* Patent Owner states: “Patent Owner does not propose any claim term [to] depart from its ordinary and customary meaning.” PO Resp. 8.

We determine that no express claim construction of any claim term is necessary for this Decision.

*D. Alleged Obviousness of Claims 1–20
over Choi, Lewin, and Zelig*

1. Principles of Obviousness

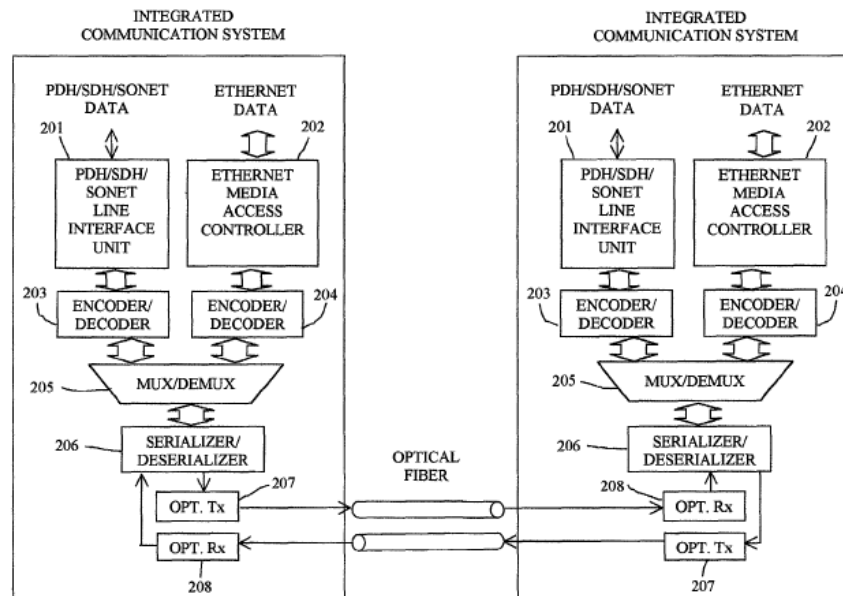
A claim is unpatentable under 35 U.S.C. § 103(a) if the differences between the claimed subject matter and the prior art are such that the subject matter, as a whole, would have been obvious to a person having ordinary skill in the art to which said subject matter pertains. *See KSR Int’l Co. v. Teleflex Inc.*, 550 U.S. 398, 406 (2007). The question of obviousness is resolved on the basis of underlying factual determinations, including (1) the scope and content of the prior art; (2) any differences between the claimed subject matter and the prior art; (3) the level of skill in the art; and (4) where in evidence, so-called secondary considerations, including commercial success, long-felt but unsolved needs, failure of others, and unexpected results (“the *Graham* factors”). *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17–18 (1966). When modifying teachings, “there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.” *KSR*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)).

2. Overview of Choi

Choi relates to a method for communicating both Ethernet and PDH/SDH/SONET data using time division multiplexing. Ex. 1008 ¶ 5. Choi provides a PDH/SDH/SONET input/output unit, an Ethernet input/output unit, a multiplexer/demultiplexer, encoder/decoder, a serializer/deserializer, and optical transmitter and receiver. *Id.* The multiplexer combines the Ethernet and PDH/SDH/SONET data into a single data stream, and the demultiplexer separates the combined data stream into Ethernet and PDH/SDH/SONET data. *Id.* The encoder/decoder encodes

and decodes the Ethernet and PDH/SDH/SONET data for communication. *Id.* The serializer/deserializer converts the parallel data into serial data and vice versa. *Id.* The optical transmitter converts the electrical signal into an optical signal, and the optical receiver converts the optical signal into an electrical signal. *Id.* Figure 2 of Choi illustrates an embodiment with separate encoders/decoders for the Ethernet and PDH/SDH/SONET data and is reproduced below:

FIG 2



Choi's Figure 2 is a block diagram of an integrated Ethernet and PDH/SDH/SONET communication system. *Id.* ¶ 10.

The illustrated system time division multiplexes PDH/SDH/SONET with Ethernet data, and transmits and receives the combined data stream using Ethernet-based communication technology. *Id.* ¶¶ 15, 18. It also uses separate encoders/decoders (203, 204) for PDH/SDH/SONET and Ethernet data. *Id.* ¶ 18. The use of separate encoders and decoders allows for the use of different encoding/decoding algorithms for PDH/SDH/SONET and Ethernet data. *Id.* Further, the multiplexing of PDH/SDH/SONET data

performed by the multiplexer is done after the data has been encoded by the encoders, and the demultiplexing of PDH/SDH/SONET data by the demultiplexer is done prior to decoding by the decoders. *Id.*

3. *Overview of Lewin*

Lewin discloses a communications system in which Ethernet to VDSL Customer Premise Equipment (“CPE”) is coupled to a DSL Access Multiplexer (“DSLAM”) over a VDSL transport facility. Ex. 1009, 4:60–63. VDSL stands for “very high rate digital subscriber line” and is described by Lewin as an emerging standard under discussion. *Id.* at 4:20–23. Lewin uses the widely known HDLC communications protocol to encapsulate Ethernet frames for transmission over the VDSL transport facility. *Id.* at 4:50–53, 6:65–67. “The HDLC protocol formatted VDSL frames are transmitted over a plurality of point to point VDSL links to CPEs where they are subsequently extracted and forwarded as standard Ethernet frames.” *Id.* at 4:53–56. “In the reverse direction, the DSLAM extracts the Ethernet signals from the plurality of CPEs and forwards the Ethernet signals to an integral Ethernet switch.” *Id.* at 4:56–59. Each CPE is connected to the DSLAM via a separate VDSL channel comprising a plurality of channel circuits. *Id.* at 5:32–35.

Figure 1 of Lewin illustrates Lewin's system and is reproduced below:

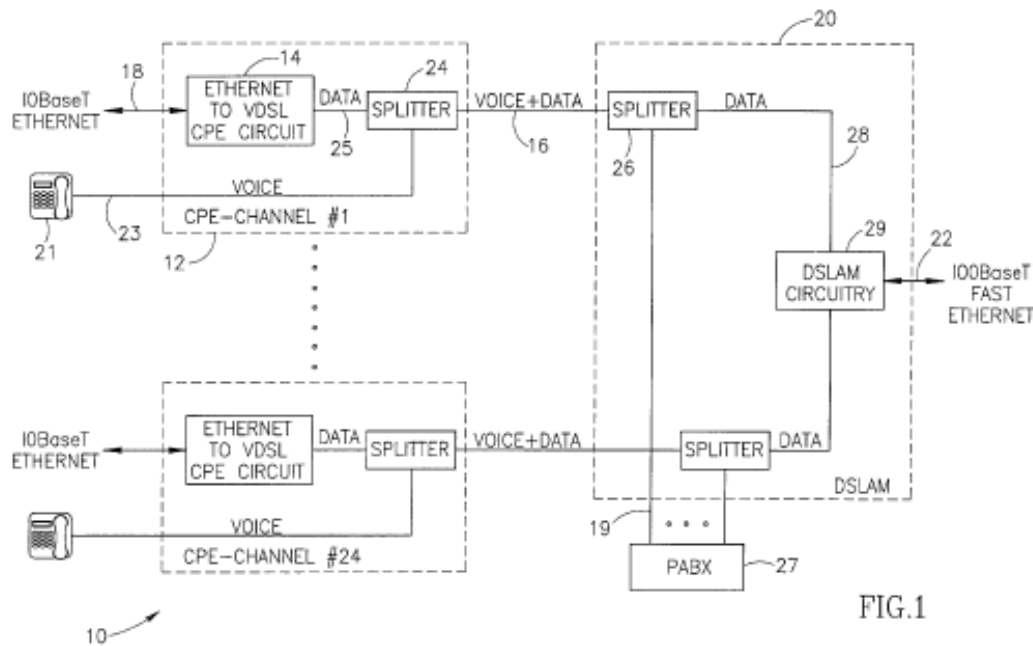


Figure 1 is a block diagram illustrating a plurality of Ethernet to VDSL CPEs coupled to a DSLAM over a VDSL transport facility that uses HDLC protocol. *Id.* at 5:51–53. System 10 includes multiple channels 12 labeled channel #1 through channel #24. *Id.* at 7:26–27.

Lewin describes:

Each channel comprises an Ethernet to VDSL Consumer Premises Equipment (CPE) circuit 14 and a splitter 24. The Ethernet to VDSL CPE circuit 14 is coupled to an Ethernet source 18 on one side and to the splitter 24 on the other. The splitter is connected to a conventional telephone set 21 and to the data signal 25 output of the CPE circuit 14. *The splitter functions to combine the data signal 25 and voice signal 23 into a composite voice+data signal 16, in one direction and to split the voice+data signal into separate voice and data signals in the reverse direction.*

Each channel 12 is coupled, via their respective VDSL facilities 16 to a DSL Access Multiplexer (DSLAM) 20. *The DSLAM 20 comprises complementary splitters 26, each functioning to split the received voice_data signal into a separate*

voice signal 19 and data signal 28. The voice signal is forwarded to a conventional PBX 27 and the data signal is input to the DSLAM circuitry 29. The DSLAM 20 is coupled to a Fast Ethernet source 22, e.g., 100BaseTx or 100BaseFx Ethernet source.

Each Ethernet to VDSL CPE 14 functions to receive a 10BaseT Ethernet signal 18 and encapsulate the Ethernet frame into an HDLC frame for transmission over the VDSL facility 16. Likewise, the Ethernet to VDSL CPE 14 also functions to receive an HDLC formatted signal over the VDSL facility and extract Ethernet frames therefrom for output as standard 10BaseT Ethernet signals 18.

The DSLAM 20 is adapted to receive HDLC frames, extract Ethernet frames therefrom and generate standard Ethernet signals. The Ethernet signals are input to an Ethernet switch with a Fast Ethernet uplink port 22. Likewise, the DSLAM 20 is also adapted to receive standard Ethernet frames from the Fast Ethernet signal 22 and encapsulate them in HDLC frames for transmission over the VDSL facility 16 to one of the CPE channels 12.

Id. at 7:33–67 (emphasis added).

4. Overview of Zelig

Zelig relates to communication networks which provide circuit emulation services over packet networks. Ex. 1010 ¶ 2. “Circuit emulation services (CES) is a developing technology for transporting SONET and legacy PDH signals over packet networks, such as Internet Protocol (IP) networks.” *Id.* ¶ 12. Zelig states that it is an object of the invention to provide methods and devices for conserving packet network bandwidth in CES. *Id.* ¶ 21. Zelig explains:

[W]hen the VTs [virtual tributaries] of a STS-1 frame are not fully populated, the unused sections are filled with default data. It is a waste of resources (particularly bandwidth) of the packet network to transmit the default data. Existing methods of CES, however, convey the full STS-1 payload, without considering its

VT structure. Therefore, in preferred embodiments of the present invention, a CES packet transmitter at the edge of a packet network, which receives a SONET input signal, is informed of or automatically detects which VTs in the signal are active. Inactive VTs are assigned a special value, preferably using the signal label bits in byte V5 of the VT payload overhead (POH), indicating that they are “unequipped” or, optionally, “unassigned.” The CES transmitter packetizes only the data in the columns of the SPE that belong to the active VTs, while discarding the default data. In this way, when the VT structure is not fully populated, the volume of data transmitted for each STS-1 frame is drastically reduced by comparison with methods known in the art.

Id. ¶ 23. Figure 1 of Zelig is reproduced below:

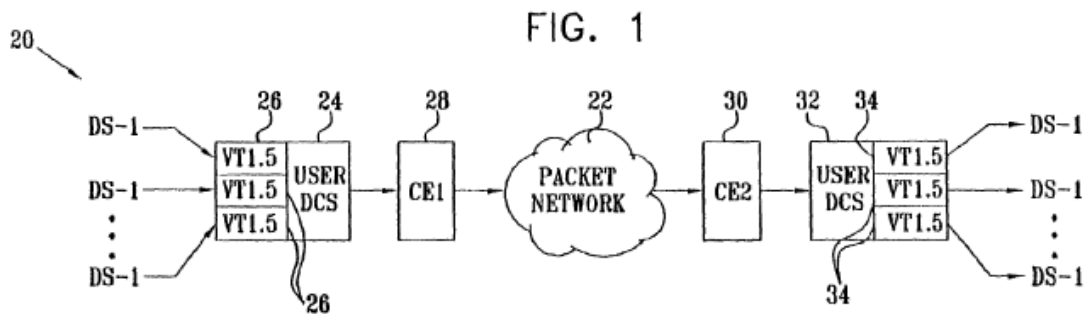


Figure 1 is a block diagram illustrating system 20 for transport of SONET signals over packet network 22 by CES. *Id.* ¶ 64. Input user digital cross-connect system (“DCS”) 24 receives multiple DS-1 subscriber signals, and multiplexes the signals in VT1.5 sections 26 of STS-1 frames in a SONET OC-N input signal. *Id.* Circuit emulation (“CE”) transmitter 28, labeled CE1, extracts the STS-1 frames from the OC-N signal and packetizes the payload data contained in the frames for transmission over network 22. *Id.*

CE1 determines which of VT1.5 sections 26 are active, i.e., actually carrying subscriber data, and which are unequipped and thus contain only default data. *Id.* ¶ 65. CE1 packetizes and transmits the subscriber data, while discarding at least some of the default data, in order to conserve

bandwidth on network 22. *Id.* CE receiver 30, labeled CE2, receives the CES packets from CE1 and reconstitutes the STS-1 frames to generate a SONET OC-N output signal with VT 1.5 sections 34 corresponding to sections 26 of the input signal. *Id.*

5. *Independent Claim 1*

a) *Recitation [1.Pre]:*

Claim 1 recites in the preamble [1.Pre]: “A method for data communications, comprising:” Ex. 1001, 19:2. Petitioner notes that Choi’s paragraph 2 describes a method for communicating Ethernet and PDH/SDH/SONET data. Pet. 61. Patent Owner presents no contrary argument. We are persuaded that Choi discloses recitation [1.Pre].⁶

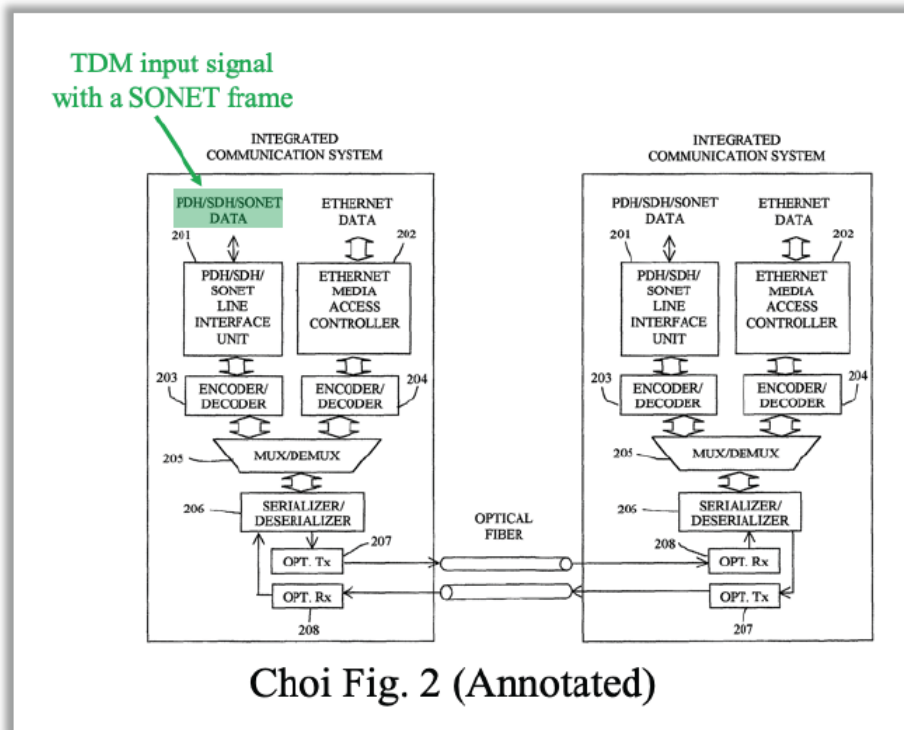
b) *Limitation [1.1]*

Claim 1 recites in limitation [1.1]: “receiving a time-division-multiplexed (TDM) input signal carrying a payload comprising data in at least one Synchronous Optical Network (SONET) frame having a plurality of virtual tributaries (VT’s) including at least one unused VT.” Ex. 1001, 19:3–7. Petitioner asserts:

Choi discloses its network switch receives a TDM-input signal: “[C]ommunication system for communicating Ethernet and PDH/SDH/SONET data using *time division multiplexing* techniques is provided. The . . . system *time division multiplexes PDH/SDH/SONET data with Ethernet data* and transmits and receives the combined data stream. . . .”

Below, Choi’s Figure 2 describes a TDM signal carrying a payload comprising data in a SONET frame. Choi describes a “PDH/SDH/SONET input/output unit is used to input and output PDH/SDH/SONET data” wherein “SONET data ranges from STS-1 (51.84 Mbps) to STS-N (N*51.84 Mbps).”

⁶ We need not decide whether this preamble recitation is limiting.



Pet. 62–63 (footnote citations omitted; alteration by Petitioner). The above-reproduced Figure 2 of Choi shows Choi’s communication system as annotated by Petitioner to identify the TDM input signal with a SONET frame, i.e., with the green annotation “TDM input signal with a SONET frame” identifying the PDH/SDH/SONET data.

Based on the foregoing, the Ethernet data is not a part of the SONET data, and Petitioner has explicitly identified, in green annotation, the input to PDH/SDH/SONET LINE INTERFACE UNIT 201 as the claimed TDM input signal carrying a payload comprising data in at least one Synchronous Optical Network (“SONET”) frame having a plurality of virtual tributaries (“VT’s”) including at least one unused VT. The “TDM-input signal” referenced in the first paragraph of the above-quoted text is not the green annotated “TDM input signal with a SONET frame,” because the former is a combined data stream including Ethernet data, and the latter does not include the Ethernet data. Instead, the “TDM-input signal” referenced in the

first paragraph of the above-quoted text appears to refer to what is received from the optical fiber at the other end of the integrated communication system via an optical fiber.

Choi does not describe that the SONET data received at line interface unit 201 is TDM. However, we are persuaded by Petitioner that Choi alone or Choi in light of Zelig would have suggested to one with ordinary skill in the art that the SONET data received by line interface unit 201 would be TDM. Petitioner asserts that it was generally known in the art that SONET is a set of standards that define transmission formats for carrying high-speed, time-domain-multiplexed (“TDM”) digital signals. Pet. 64 (citing Ex. 1001, 1:13–16). Patent Owner does not argue to the contrary. We are persuaded that it would have been obvious to one with ordinary skill in the art in light of Choi that the SONET data input at line interface unit 201 is a time-division-multiplexed signal.

We also are persuaded that Choi in light of Zelig reasonably would have suggested SONET input frames which are time-division-multiplexed signals. Petitioner asserts:

Zelig teaches receiving TDM-input signals carrying payloads having SONET frames. For instance, Zelig receives a TDM-input signal carrying a SONET payload, and sends that payload to a circuit emulation module to transport the payload over a packet network. Zelig explains this technique “allows the network operator to maintain existing TDM service interfaces in a manner transparent to network users, even when the data traffic travels through a core packet network. Like the ’755 Patent, Zelig states it was known in the art that SONET defines “transmission formats for carrying highspeed, time-domain-multiplexed (TDM) digital signals.”

Id. at 64–65 (footnote citations omitted). Patent Owner does not dispute what Zelig allegedly describes, that it was known in the art that SONET defines transmission formats for carrying TDM signals.

Further, Petitioner adequately explains how Choi in light of Zelig reasonably would have suggested SONET frames having multiple VTs including an unused VT:

Zelig teaches it was well known in the art that SONET frames include multiple VTs that compose virtual tributary groups (“VTGs”) having four possible sizes: VT1.5, VT2, VT3, and VT6. And Zelig teaches SONET VTs may include unused VTs, e.g., SONET STS-1 frames having VTs that aren’t fully populated. As discussed above, Choi discloses SONET data having STS-1 frames.

Based on Zelig, a POSITA [person of ordinary skill in the art] would have found it obvious to have Choi’s SONET frame comprise a plurality of VTs including at least one unused VT. A POSITA would have been motivated to do so because dividing SONET frames into VTs, some of which are unused and filled with default data, was the industry standard for carrying SONET payload and overhead data.

Id. at 65–66 (footnote citations omitted). Dr. Lavian testifies that “dividing SONET frames into VTs, some of which are unused and filled with default data, was the industry standard for carrying SONET payload and overhead data.” Ex. 1003 ¶ 254 (cited at Pet. 66). Patent Owner has not argued to the contrary.

For the foregoing reasons, we are persuaded that Choi and Zelig reasonably would have suggested limitation [1.1].

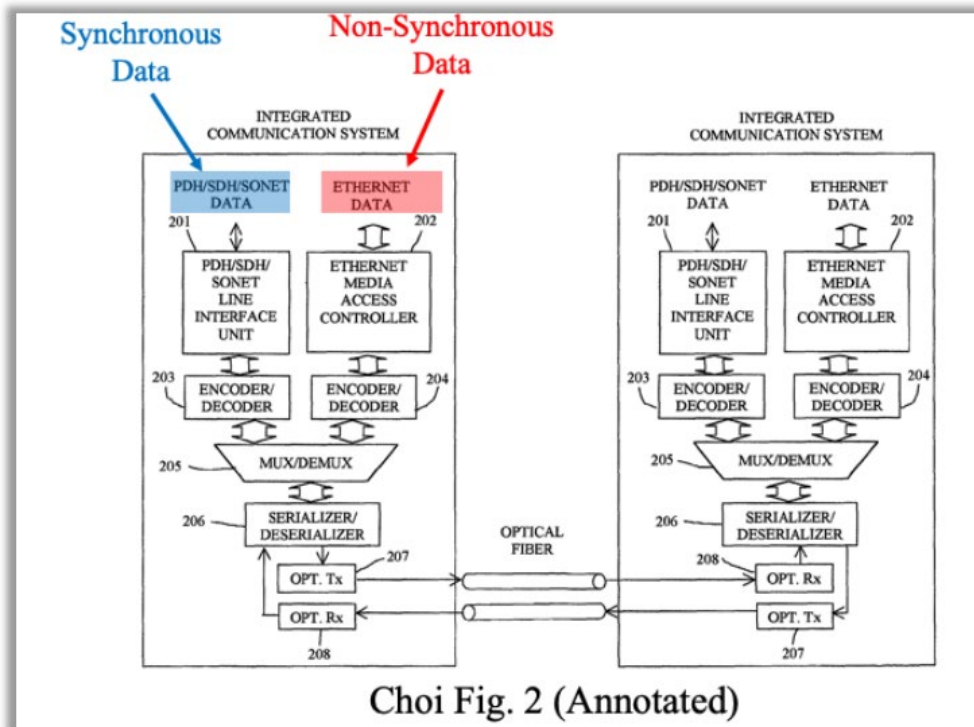
c) Limitation [1.2]

Claim 1 recites in limitation [1.2]: “determining whether the data comprise synchronous or non-synchronous data.” Ex. 1001, 19:8–9. The term “the data” has its antecedent basis in the payload carried by the time-

division-multiplexed (“TDM”) input signal of limitation [1.1]. *Id.* at 19:3–9. As discussed above in connection with limitation [1.1], and as presented by Petitioner, that payload data is the TDM SONET data received as input at PDH/SDH/SONET Line Interface Unit 201.

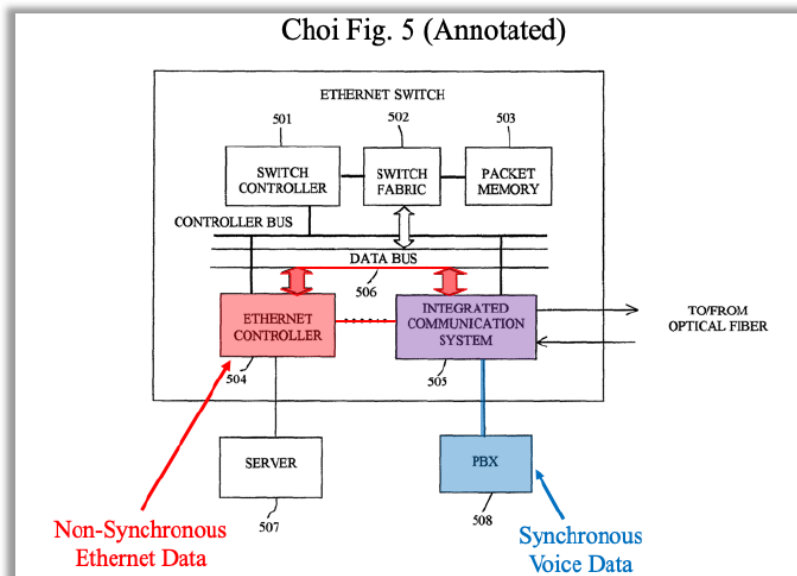
(1) *Petitioner’s Contentions*

Petitioner asserts that Choi discloses or renders obvious determining whether the data includes synchronous or nonsynchronous data. Pet. 67. According to Petitioner, Choi teaches that the SONET/SDH/PDH signals include legacy voice data such as those used in a private branch exchange system (“PBX”), and that a person of ordinary skill in the art would have understood that voice data transmitted over a SONET/SDH/PDH frame is synchronous data. Pet. 67–68. Further according to Petitioner, it was generally known in the art that Ethernet data is non-synchronous data. *Id.* at 68. Petitioner produces an annotated version of Choi’s Figure 2 on page 68 of the Petition, reproduced below:



Petitioner's annotated version of Figure 2 of Choi shows Choi's integrated communication system wherein synchronous data, marked in blue, is received as input at PDH/SDH/SONET Line Interface Unit 201, and non-synchronous Ethernet data, marked in red, is received as input at Ethernet Media Access Controller 202.

Petitioner further notes that Choi's Figure 5 shows receiving synchronous data from PBX 508 and receiving non-synchronous data from Ethernet Controller 504, and produces an annotated version of Choi's Figure 5 on page 69 of the Petition, reproduced below:



Pet. 69. Annotated Figure 5 is a block diagram of an Ethernet switch that shows integrated communication system 505 receiving separate inputs, i.e., synchronous voice data, marked in blue, from PBX 508, and non-synchronous Ethernet data, marked in red, from Ethernet Controller 504.

Petitioner additionally asserts:

When discussing multiplexing and demultiplexing the data, Choi teaches “[s]everal methods can be used in the integrated communication system to distinguish between

PDH/SDH/SONET and Ethernet data” including examining framing bit(s) or special characters inserted in the data or separated coding spaces. And when analyzing the data packets for decoding, Choi teaches “data is separated into PDH/SDH/SONET data and Ethernet data.”

Pet. 69–70 (citing Ex. 1008 ¶¶ 17, 21).

On the basis of the foregoing, Petitioner asserts that Choi discloses determining whether the received data is synchronous voice data or non-synchronous Ethernet data. *Id.* at 70.

Alternatively, Petitioner asserts that it would have been obvious to one with ordinary skill in the art, in light of Choi’s disclosure itself, “to have Choi’s switch determine whether the data is synchronous or non-synchronous.” *Id.* Petitioner explains that it was generally known in the art that TDM networks were commonly used to transport synchronous voice data as well as non-synchronous packet data, and that synchronous voice data need to be transported in real-time at constant data rates while non-synchronous packet data such as Ethernet/IP frames need only accommodate bursts of peak data rates. *Id.* On that basis, Petitioner contends that it would have been obvious to one with ordinary skill in the art to have Choi’s receiver “determine whether [the] frames comprise voice data needing constant data rates or non-synchronous data needing only bursts of peak data rates.” *Id.* at 70–71.

Further, in the alternative, Petitioner asserts that it would have been obvious to one with ordinary skill in the art, based on the combined teachings of Chou and Lewin, to determine “whether the data includes synchronous or non-synchronous data.” *Id.* at 71. Specifically, Petitioner explains that Lewin teaches receiving at one input TDM signals containing both voice and data traffic and then splitting the voice signal from the input

to send to a PBX (Private Branch Exchange) module and Ethernet data from the input data to send to an uplink circuitry. *Id.* at 72–73. Petitioner produces an annotated Figure 1 of Lewin on page 72 of the Petition, reproduced below:

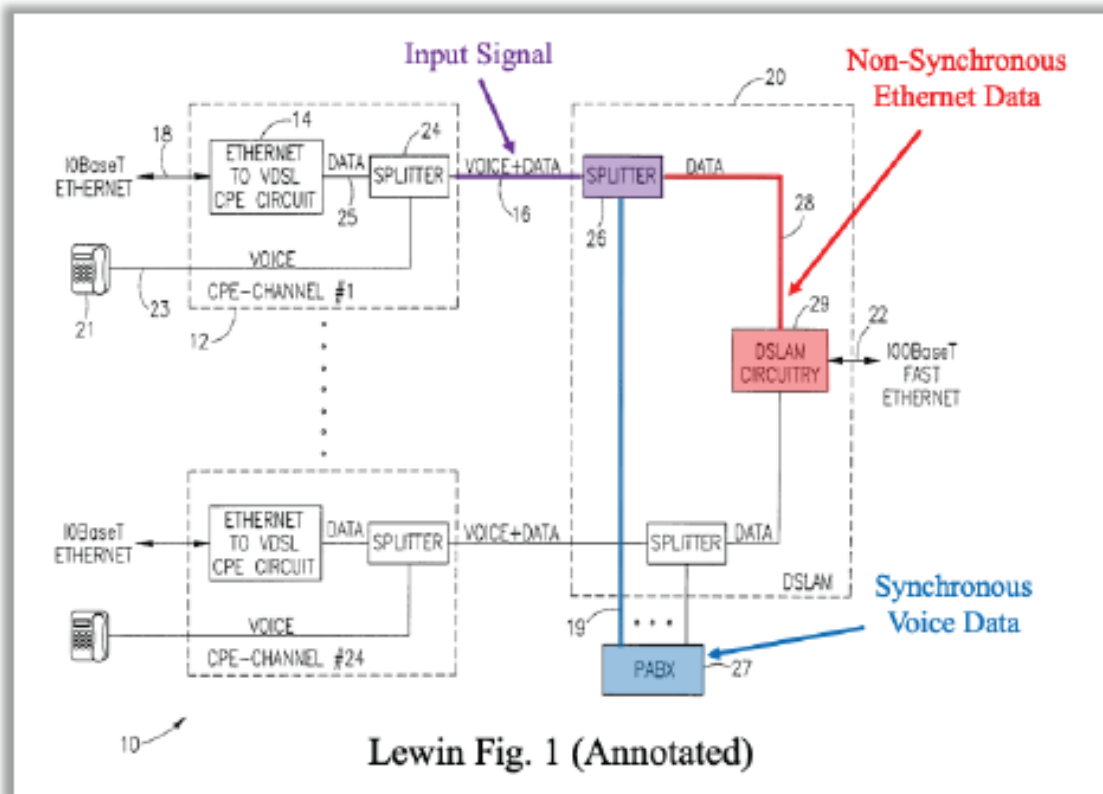


Figure 1 (color annotated by Petitioner) illustrates Lewin's system 10 including a plurality of channels 12 each of which includes an Ethernet to VDSL Consumer Premise Equipment (CPE circuit 14) and a splitter 24. Ex. 1009, 7:23–34. Lewin describes that splitter 24 splits input into separate voice signal 19 and data signal 28. *Id.* at 7:44–47. Lewin also describes that the split voice signal is forwarded to conventional PBX 27 and that the data signal is input to DSLAM (Digital Subscriber Line Access Multiplexer) circuitry 29. *Id.* at 7:47–49. The DSLAM circuitry is coupled to Fast Ethernet source 22. *Id.* at 7:49–51.

Petitioner explains:

Based on Lewin's teachings and the general knowledge in the art, it would have been obvious to modify Choi's integrated communication system to receive multiplex signals and determine whether the signals' data comprise synchronous voice data or nonsynchronous Ethernet data. A POSITA would have been motivated to do so because this would allow Choi's integrated communication system to receive HDLC frames and to determine whether the frames' data contains synchronous voice SONET frames for processing by components 201/203 or contains non-synchronous Ethernet frames for processing by components 202/204. This would in turn allow the data to be processed more efficiently and effectively further[ing] Choi's goal of reducing cost.

Pet. 74 (citations omitted).

(2) *Patent Owner's Contentions*

Patent Owner asserts that Petitioner's assertion that Choi discloses limitation [1.2] fails because in all of Petitioner's description of Choi's disclosure, whether it is annotated Figure 2 or annotated Figure 5, there are separate inputs for inputting synchronous data and non-synchronous data to Choi's integrated communication system, i.e., blue for synchronous data and red for non-synchronous data. PO Resp. 48–50. Patent Owner also notes that the TDM input signal of limitation [1.1] as identified by Petitioner, which carries the payload data which is supposed to be acted on by the step in limitation [1.2], does not pass through Ethernet Media Access Controller 202 of Figure 2 or Ethernet Controller 504 of Figure 5. Further, Patent Owner asserts that Petitioner's reliance on the text "data is separated into PDH/SDH/SONET data and Ethernet data" in paragraph 17 of Choi "is misplaced because Choi provides no indication the cited portion Petitioner relies on is characterizing the TDM data received at Choi's element 201, the SONET line interface unit." *Id.* at 50.

In summary, with regard to Petitioner's assertion that Choi discloses limitation [1.2], Patent Owner states: "as supported by Petitioner's annotations, Choi does not disclose any step to determine whether the data it receives is synchronous or non-synchronous because the two types of data are arriving as separate inputs." *Id.*

With regard to Petitioner's assertion that Choi renders obvious limitation [1.2], Patent Owner asserts (1) that Petitioner's reasoning is based only on disclosure of the '755 patent and conclusory statements of Dr. Lavian and (2) that because in Choi the synchronous data and non-synchronous data are already arriving separately at respective inputs it is unnecessary to have a determining step to separate the synchronous data from the non-synchronous data. *Id.* at 51.

With regard to Petitioner's assertion that Choi and Lewin in combination would have rendered obvious limitation [1.2], Patent Owner asserts (1) that because Lewin does not discuss SONET at all, one with ordinary skill would not have combined Lewin's disclosure with the SONET-based aspects of Choi, (2) that one with ordinary skill in the art would not have considered a frequency division multiplexing system ("FDM") such as the one disclosed in Lewin to be a suitable replacement for a TDM system disclosed in Choi, and also would not have expected to combine the two without undue experimentation, and (3) that what Lewin shows, i.e., separating voice data from packet data within a common input so that the voice data can go to a PBX and the packet data can go to Ethernet, is fundamentally different from what Choi shows, i.e., synchronous data already arriving separately from packet data on different inputs, so that one with ordinary skill "would not have been motivated to combine them or to be successful in doing so." *Id.* at 52–53.

(3) *Analysis*

We are not persuaded by Petitioner’s contention that Choi discloses limitation [1.2]. First, Petitioner has shown that there are separate inputs for synchronous data and non-synchronous data, not that there is any means or step within Choi’s integrated communication system to determine whether the data it receives is synchronous or non-synchronous.

Second, as we discussed above, the antecedent basis for “the data” is the payload carried by the time-division-multiplexed (“TDM”) input signal of limitation [1.1]. The payload data in that input route does not go through Ethernet Media Access Controller 202 or Ethernet Controller 504. Thus, the non-synchronous Ethernet data Petitioner refers to in Choi is not a part of “the data” relied on by Petitioner to meet limitation [1.1].

Third, with respect to the text from Choi quoted by Petitioner (Pet. 70), “data is separated into PDH/SDH/SONET data and Ethernet data” (Ex. 1008 ¶ 17), Petitioner’s reliance is misplaced, because there is no indication that the identified description relates to the TDM data received at PDH/SDH/SONET Line Interface Unit 201. Rather, the description relates to data received from the optical fiber at the other end of the integrated communication system, where synchronous and non-synchronous data have already been combined into one data stream. For instance, Choi states: “[T]he combined PDH/SDH/SONET and Ethernet data stream received from the optical fiber are demultiplexed within the integrated communication system and send to the PBX (508) and server (507) respectively.” Ex. 1008 ¶ 22.

Petitioner counters in its Reply that the specification of the ’755 patent discloses embodiments having separate inputs for synchronous data and non-synchronous data, and that it is improper to read a claim in a

manner that excludes a disclosed embodiment, citing *Vitronics Corp. v. Conceptronics, Inc.*, 90 F.3d 1576, 1583 (Fed. Cir. 1996). Reply 23.

Petitioner characterizes *Vitronics Corp.* as “finding that a claim interpretation that excludes a preferred embodiment is ‘rarely, if ever, correct.’” *Id.* at 23 n.89. Petitioner asserts:

The ’755 Patent doesn’t preclude embodiments disclosed in the ’755 Patent specification. The ’755 Patent doesn’t preclude systems that utilize separate inputs for synchronous and non-synchronous data. Rather, the ’755 Patent acknowledges that systems are “[t]ypically configured with separate inputs for separate sources. And the ’755 Patent further provides that input sources could also be associated with their own ports, allowing for automatic identification of signal type and encapsulation. The claims themselves don’t state that the input signals need to be separate, and the ’755 Patent includes such configurations as embodiments. As such, Choi’s disclosure of separate signal inputs meets the challenged claim limitations.

Id. at 23–24. The argument is unavailing.

Petitioner oversimplifies the issue. As discussed above, the deficiency of the Petition includes a discrepancy in the data path relied on by Petitioner for its analysis. For instance, Petitioner treats the input to PDH/SDH/SONET Line Interface Unit 201, which is already only synchronous data, as the incoming TDM signal with payload data satisfying limitation [1.1]. Pet. 62–63. For limitation [1.2], rather than staying with the data path identified in the context of limitation [1.1], Petitioner broadens the input path to include the input to Ethernet Media Access Controller 202 as well. *Id.* at 68–70. Petitioner identifies no similar description in the specification of the ’755 patent. Petitioner also identifies no description in the specification of the ’755 patent about a determining step that is applied to an input signal already known to be synchronous or non-synchronous.

Thus, Petitioner has shown no disclosed embodiment in the specification of the '755 patent that works in the same way Petitioner accounts for limitation [1.2]. *Vitronics Corp.*, *supra*, cited by Petitioner, is inapposite.

The facts of *Vitronics Corp.* are further distinguishable from the circumstance here. Only a single embodiment is disclosed in *Vitronics Corp.*, whereas the specification of the '755 patent describes multiple different embodiments. In *Vitronics Corp.*, the Federal Circuit stated:

Indeed, if “solder reflow temperature” were defined to mean liquidus temperature, a preferred (*and indeed only*) embodiment in the specification would not fall within the scope of the patent claim. Such an interpretation is rarely, if ever, correct and would require highly persuasive evidentiary support, which is wholly absent in this case.

Vitronics Corp., 90 F.3d at 1583 (emphasis added). We do not read *Vitronics Corp.* as setting forth that where there are multiple embodiments in the specification, reading a claim to exclude one is rarely, if ever, correct.

In any event, Petitioner’s assertions fail not because we determine, categorically, that the claim cannot cover separate inputs for synchronous and non-synchronous data. We need not and do not so determine. Rather, Petitioner’s assertions fail because for limitation [1.1] Petitioner identifies a TDM input signal with payload data but for limitation [1.2] Petitioner does not stay with that data path when accounting for the determining step.

We also are not persuaded by Petitioner’s contention that it would have been obvious to one with ordinary skill in the art, in light of Choi’s disclosure, “to have Choi’s switch determine whether the data is synchronous or non-synchronous.” Pet. 70.

The TDM input data relied on by Petitioner and as explained above in the context of limitation [1.1] is received through PDH/SDH/SONET Line

Interface Unit 201 and does not include Ethernet data which is non-synchronous and received separately through Ethernet Media Access Controller 202. This is a different circumstance from that in which both synchronous and non-synchronous data are received at one input port. Further, the only example of what is connected to PDH/SDH/SONET Line Interface Unit 201 is a PBX, which according to Petitioner supplies synchronous voice data. *See* Pet. 69; Ex. 1008, Fig. 5.

Where there is a separate input for non-synchronous data, as in Choi, Petitioner provides no reasonable basis for one with ordinary skill in the art to expect to find any non-synchronous data in the TDM SONET input received at line interface unit 201 for which the only described input is synchronous voice data. That is so notwithstanding that SONET frames are capable of carrying non-synchronous data. We find that no reasonable motivation is provided by Petitioner for one with ordinary skill in the art to provide or add a determining step that acts on the TDM SONET input received at line interface unit 201.

Further, we are not persuaded by Petitioner's assertion that it would have been obvious to one with ordinary skill in the art, in light of Choi and Lewin, to determine whether the data includes synchronous or non-synchronous data. Pet. 71. First, as presented by Petitioner, Choi discloses separate inputs for Ethernet data, which is nonsynchronous, sent through Ethernet Media Access Controller 202, and for synchronous data supplied to PDH/SDH/SONET Line Interface Unit 201. *Id.* at 68. Thus, Choi's system is not comparable with or similar to Lewin's system which has a common input providing both synchronous voice data and nonsynchronous packet data. Second, in Lewin's system it is necessary to separate the voice data from the packet data so that the voice data can be routed to a PBX and the

packet data can be routed to the Ethernet. The situation at the input ports identified by Petitioner in Choi is the opposite. *Id.* (annotating Choi's Figure 2). Through the separate inputs identified by Petitioner, *id.*, Choi seeks to combine synchronous data and nonsynchronous data to send to a network over optical fiber. Ex. 1008 ¶¶ 16, 18. The splitting function of Lewin has no reasonable application at the input locations identified by Petitioner.

(4) *Conclusion*

For reasons discussed above, we are not persuaded by Petitioner that Choi discloses or reasonably would have suggested limitation [1.2]. We also are not persuaded by Petitioner that Choi in combination with Lewin satisfies or accounts for the requirement of limitation [1.2].

d) *Limitation [1.3]*

Claim 1 recites in limitation [1.3]: “selecting a first encapsulation scheme if the data comprise synchronous data, and a second encapsulation scheme if the data comprise non-synchronous data, wherein the selected encapsulation scheme includes suppression of the at least one unused VT.” Ex. 1001, 19:10–14.

Petitioner asserts that “Choi discloses a first encapsulation scheme if the data comprises synchronous data in PDH/SDH/SONET frames.” Pet. 75. Petitioner asserts that “Choi discloses a second encapsulation scheme if the data comprises non-synchronous Ethernet frames.” *Id.* at 76. Petitioner annotates a portion of Choi's Figure 2 (*id.*) to illustrate its assertions:

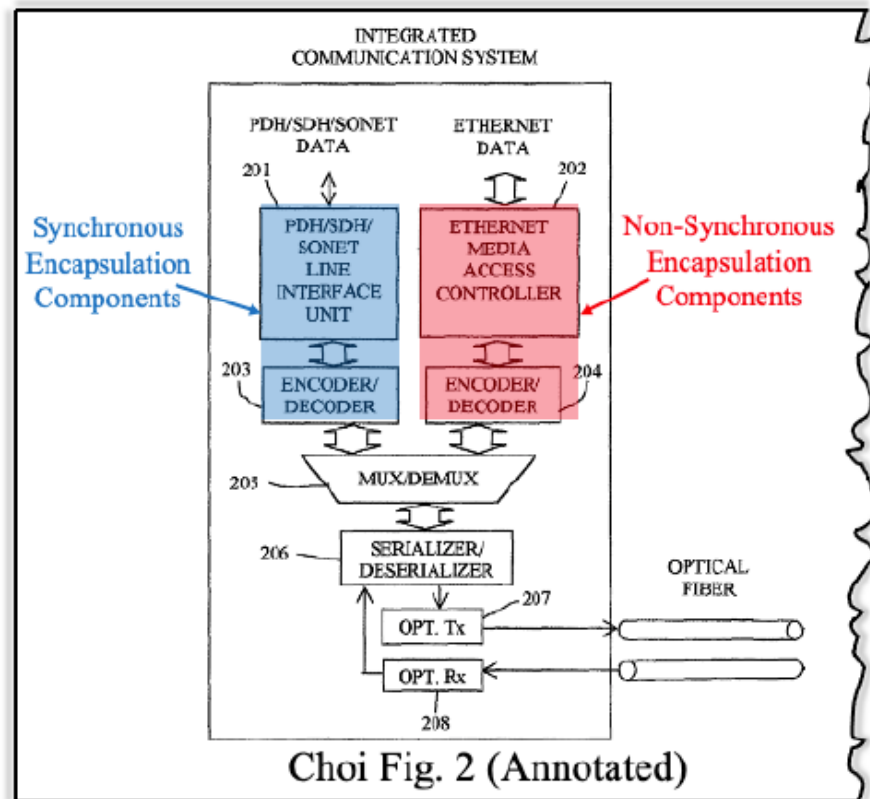


Figure 2 of Choi shows an embodiment of Choi's integrated communication system. Ex. 1008 ¶ 10. We are not persuaded by Petitioner's assertion because what Petitioner relies on to show encapsulation of non-synchronous data is outside of the input data path earlier identified by Petitioner.

Specifically, as illustrated by Petitioner, the non-synchronous data being encapsulated is not any part of the TDM input signal including data in a SONET frame that Petitioner relies on to show satisfaction of limitation [1.1]. See Pet. 63. The term "the data" in limitation [1.3] has its antecedent basis in the payload carried by the time-division-multiplexed (TDM) input signal of limitation [1.1]. Ex. 1001, 19:3–14. Thus, the data flow as earlier identified by Petitioner is through PDH/SDH/SONET Line Interface Unit 201 and Encode/Decoder 203, and does not pass through Ethernet Media Access Controller 202 and Encode/Decoder 204.

Accordingly, we are not persuaded by Petitioner that Choi discloses limitation [1.3]: “selecting a first encapsulation scheme if the data comprise synchronous data, and a second encapsulation scheme if the data comprise non-synchronous data, wherein the selected encapsulation scheme includes suppression of the at least one unused VT.”

e) Conclusion

Petitioner has not proven, by a preponderance of the evidence, that claim 1 would have been obvious over Choi, Lewin, and Zelig.

6. Dependent Claims 2–20

Claims 2–20 each depend, directly or indirectly, from claim 1, and thus include all of the limitations of claim 1. The deficiencies of Petitioner’s assertions for claim 1, specifically for limitations [1.2] and [1.3], are also applicable to dependent claims 2–20. Therefore, Petitioner has not proven, by a preponderance of the evidence, that any of claims 2–20 would have been obvious over Choi, Lewin, and Zelig.

*E. Alleged Obviousness of Claims 1–20
over Cohen, Cao, and Malis⁷*

1. Overview of Cohen

Cohen relates to methods of compressing packetized data streams, particularly SONET/SDH streams. Ex. 1005, 1:10–11. SDH, Synchronous

⁷ Patent Owner argues that because Cohen and Malis are admitted prior art through incorporation by reference into the disclosure of the ’755 patent, they cannot be applied against the challenged claims, citing *Qualcomm Inc. v. Apple Inc.*, 24 F.4th 1367 (Fed. Cir. 2022), and *In re Lopresti*, 333 F.2d 932, 934 (CCPA 1964). PO Resp. 19 n.1, 34 n.5. The argument is unavailing. Even assuming that Cohen and Malis are admitted prior art, that does not take away or undermine their status as prior art printed publications. *Qualcomm* and *Lopresti* do not indicate otherwise.

Digital Hierarchy, is the international version of the SONET standard. *Id.* at 1:13–14. The basic building block signal for SONET is the Synchronous Transport Signal level 1 (“STS-1”) operating at 51.84 Mbps. *Id.* at 1:24–25. Higher speed SONET signals, such as STS-3, can be composed by Time Division Multiplexing (TDM) multiple STS-1 signals. *Id.* at 1:25–26. SONET frames are sent 8000 times a second and the SONET frame is composed of a transport overhead and a Synchronous Payload Envelope (“SPE”) that carries the data. *Id.* at 1:29–31. The SPE carries overhead bytes and data payload. *Id.* at 1:31. “The 9 overhead bytes called Path Overhead (POH) include a byte that specifies the data signal type carried within the SONET payload, as well as other bytes used for various operation, alarms and maintenance tasks.” *Id.* at 1:31–2:2.

Cohen states that it “provide[s] a method for compressing a packetized SONET/SDH stream for transmission over a packet switched network, comprising identifying a C2 byte in the stream, and, based on the identification, applying a C2 byte-related compression algorithm to compress the stream.” *Id.* at 3:9–13. Figure 2 of Cohen is illustrative and reproduced below:

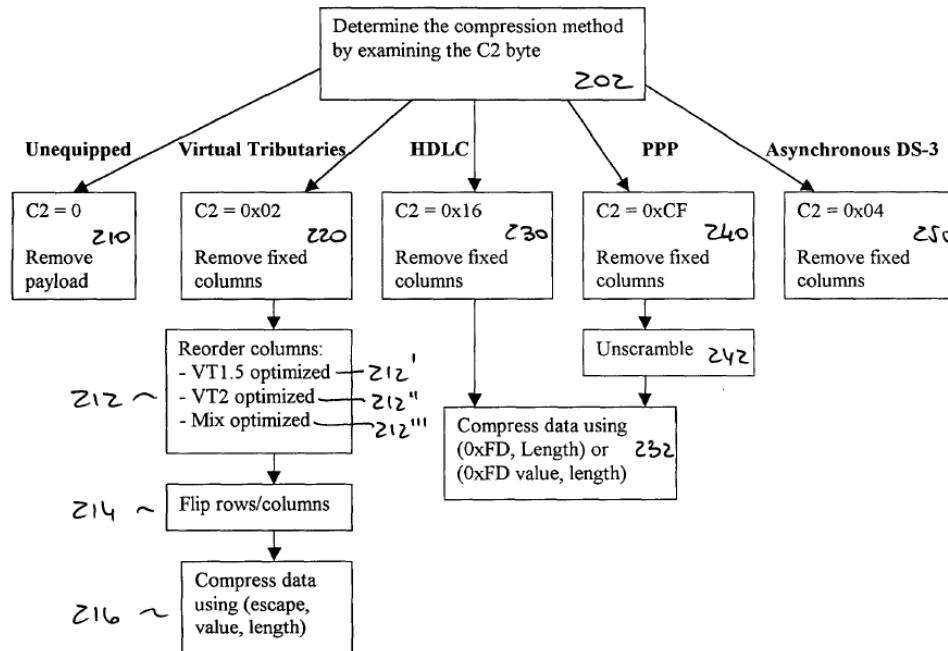


FIG. 2

Figure 2 shows a block diagram of the various embodiments of the compression algorithms implemented based on examination of the C2 byte. *Id.* at 8:18–20. Cohen describes that the choice made by compression method step 202 based on the C2 byte leads to one of five embodiments:

1. **Unequipped C2=0x0** (block 210)
2. **Virtual Tributaries C2=0x02** (block 220)
3. **HDLC C2=0x16** (block 230)
4. **PPP C2=0xCF** (block 240)
5. **Asynchronous DS-3 C2=0x04** (block 250)

Id. at 8:22–28. With regard to the C2 byte indicating the Unequipped type, Cohen states: “In this case, existing in the art, unequipped signals carry no meaningful payload, and the ingress packetizer discards the complete SPE payload and sends the packet indicating the unequipped signal within the payload header.” *Id.* at 8:30–9:2.

Figure 1 of Cohen is reproduced below:

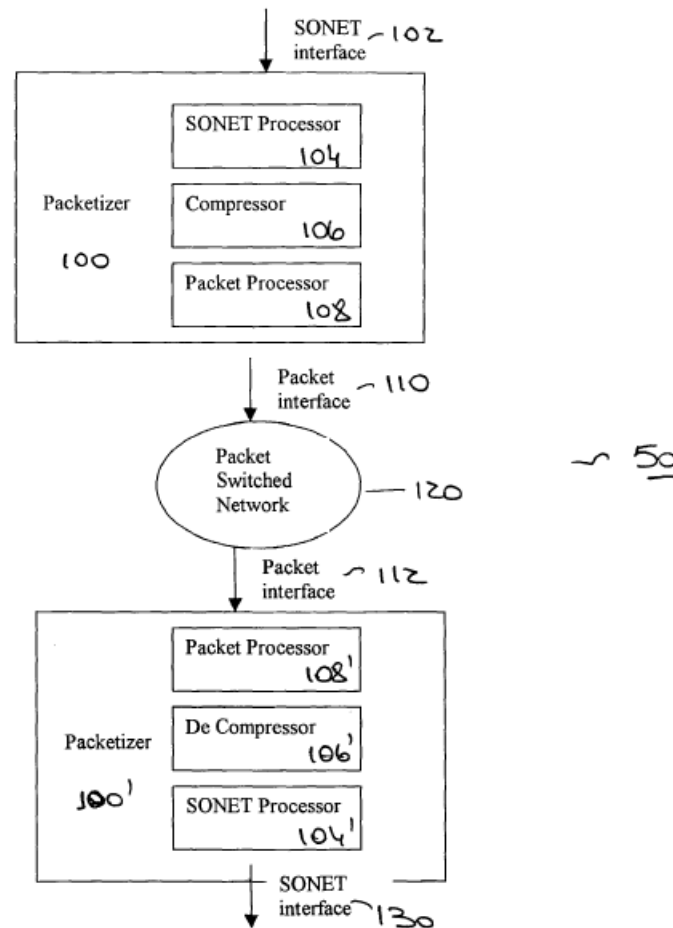


FIG. 1

Figure 1 of Cohen is a block diagram illustrating a system implementing the method according to Cohen. *Id.* at 6:4–6. System 50 includes ingress packetizer 100 and egress packetizer 100'. *Id.* “[E]ach packetizer of the present invention provides different compression and/or decompression algorithms based on the SONET POH C2 signal label byte.” *Id.* at 6:10–12.

SONET Processor 104 identifies and examines the C2 byte in the input and then forwards payload data to Compressor 106 which compresses the data using a compression algorithm selected by the C2 byte. *Id.* at 6:23–

27. “Next follows an encapsulation step done by a Packet Processor 108, in which the compressed payload is encapsulated in a packet.” *Id.* at 6:31–32.

2. *Overview of Cao*

Cao relates to telecommunications systems and to efficient switching of both voice and data telecommunications traffic. Ex. 1006, 1:6–8. Cao discloses a hybrid switch which includes two types of switching fabrics, packet switching and circuit switching. *Id.* at 2:39–41. The hybrid switch also includes a hybrid switch manager and one or more input/output ports (“I/O ports”). *Id.* at 2:41–42. Telecommunication traffic enters the hybrid switch, is switched by the hybrid switch, and then departs to a telecommunications network through the I/O ports. *Id.* at 2:42–45.

A packet-switched switching network can be an asynchronous transfer mode (“ATM”) switch fabric or an Internet Protocol (“IP”) switch fabric. *Id.* at 2:32–35. A circuit switched fabric can be a synchronous transfer mode (STM) switch fabric.⁸ *Id.* at 2:28–32. Real-time communications, such as voice traffic, may be switched through an STM switch fabric, and non-real-time traffic may be switched through an ATM or IP switch fabric. *Id.* at 2:26–35.⁹

Cao describes:

In an illustrative embodiment, a SONET/SDH path layer overhead byte is employed to indicate to the hybrid switch manager which type of switch fabric, for example, STM or ATM, should be employed to switch the traffic associated with the SONET/SDH path layer overhead byte. This determination is

⁸ An STM fabric may use a Synchronous Transport Signal (“STS”). *Id.* at 2:22–26.

⁹ Cao states that for ease and clarity of description, “packet switched fabrics, which may be either IP or ATM fabrics, will be referred to hereinafter as ATM switch fabrics.” *Id.* at 2:35–38.

made by the manager as the traffic arrives at the I/O port. Because the traffic load is shared, in parallel fashion, between the STM and ATM fabrics, neither switch need be of sufficient magnitude to accommodate the entire traffic load. In an illustrative embodiment the C2 byte within a SONET/SDH path overhead is used to indicate whether the associated traffic is to be routed to an STM, an IP and/or an ATM switch fabric.

Id. at 2:44–57. Specifically, Cao further describes:

The C2 byte within a SONET/SDH path overhead indicates a synchronous payload envelope (SPE) construction type. For example:

C2=14(hex), SPE is carrying DQDB traffic

C2=15(hex), SPE is carrying FDDI traffic

C2=04(hex), SPE is carrying DS3 traffic

C2=13(hex), SPE is carrying ATM traffic

C2=cf(hex), SPE is carrying PPP (IP) traffic

Id. at 5:31–41.

3. *Overview of Malis*

Malis discloses a method for encapsulating time-division multiplexed (“TDM”) signals, specifically circuit-oriented TDM signals, for transmission over packet-switched networks (“PSN”).¹⁰ Ex. 1007, 2. Malis states that the transmission system for circuit-oriented TDM signals is the Synchronous Optical Network (“SONET”) and Synchronous Digital Hierarchy (“SDH”).

Id. Malis also states: “PSNs must emulate the circuit characteristics of SONET/SDH payloads. MPLS labels and a new circuit emulation header are used to encapsulate TDM signals and provide the Circuit Emulation Service over MPLS (CEM) function.” *Id.* Malis further states that it

¹⁰ Malis describes that the PSNs it supports include MPLS and IP. Ex. 1007, 1.

describes how to provide CEM for various digital signals including “SONET STS-1 synchronous payload envelope (SPE)/ SDH VC-3.” *Id.*

To transport SONET/SDH SPEs through a packet-switched network, Malis proposes breaking the SPE into fragments and pre-appends to each fragment a 32-bit CEM Header. *Id.* at 3. Figure 1 of Malis illustrates a basic CEM packet and is reproduced below:

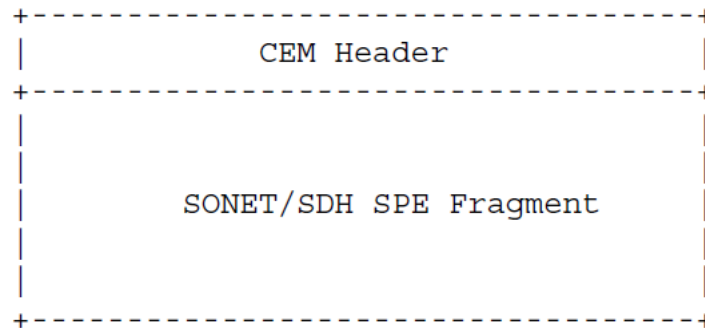


Figure 1. Basic CEM Packet

Figure 1 is a block diagram of a basic CEM packet. As shown, a 32-bit CEM header is placed at the front of a SONET /SDH SPE fragment. *Id.*

With regard to transporting a CEM packet over an MPLS network, Malis describes:

To transport a CEM packet over an MPLS network, an MPLS label-stack MUST be pushed on top of the CEM packet.

The last two labels prior to the CEM header are referred to as the Tunnel and Virtual Circuit (VC) labels.

The VC label is required, and is the last label prior to the CEM Header. The VC label MUST be used to identify the CEM connection within the MPLS tunnel.

The optional tunnel label is immediately above the VC label on the label stack. If present, the tunnel label MUST be used to identify the MPLS LSP used to tunnel the TDM packets through the MPLS network (the tunnel LSP).

Id. at 5. Figure 3 of Malis illustrates a typical MPLS Transport Encapsulation and is reproduced below:

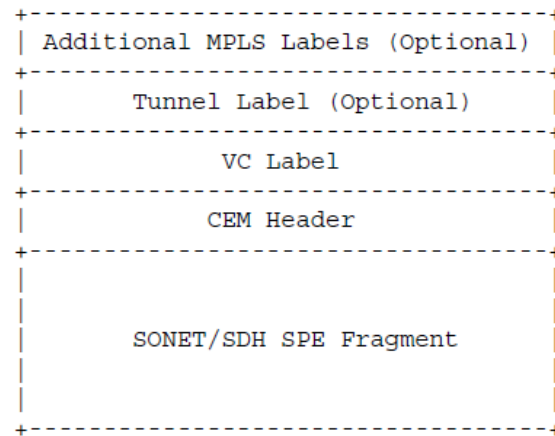


Figure 3. Typical MPLS Transport Encapsulation

Figure 3 is a block diagram of a MPLS transport encapsulation. As shown in Figure 3, in MPLS transport encapsulation, the VC Label is required and is placed immediately before the CEM Header, Tunnel Label is optionally placed in front of the VC Label, and additional optional MPLS Labels may be placed in front of the optional Tunnel Label. *Id.*

4. *Independent Claim 1*

a) *Recitation [1.Pre]*

Claim 1 recites in the preamble [1.Pre]: “A method for data communications, comprising:” Ex. 1001, 19:2. Petitioner persuasively notes that Cohen’s Figure 1 illustrates a method for sending data packets over a network. Pet. 17–18. Patent Owner presents no contrary argument. We are persuaded that Cohen discloses recitation [1.Pre].¹¹

b) *Recitation [1.1]*

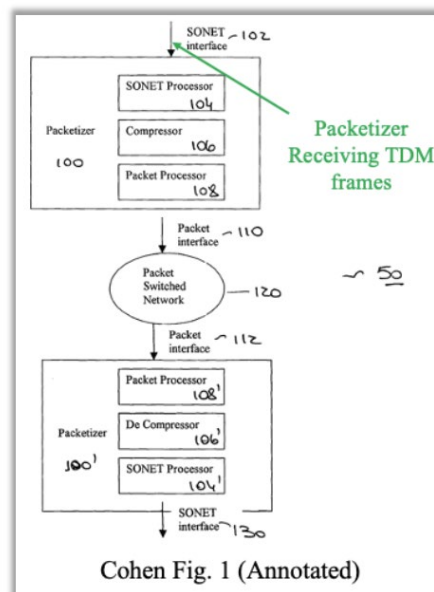
Claim 1 recites in limitation [1.1]: “receiving a time-division-multiplexed (TDM) input signal carrying a payload comprising data in at

¹¹ We need not decide whether this preamble recitation is limiting.

least one Synchronous Optical Network (SONET) frame having a plurality of virtual tributaries (VT's) including at least one unused VT.” Ex. 1001, 19:3–7. Petitioner asserts that Cohen discloses this limitation. Pet. 18.

Petitioner explains: “Cohen describes receiving TDM-input signals carrying a payload having SONET frames. For instance, Cohen teaches it was known that ‘[h]igher speed SONET signals can be composed of Time Division Multiplexing (TDM) multiple STS-1 signals.’” *Id.* at 18–19 (quoting Ex. 1005, 2:25–26) (alternation by Petitioner). Petitioner further explains: “Below, Cohen’s Figure 1 discloses an incoming packetizer 100 having SONET interface 102 for sending SONET frames through SONET Processor 104. Cohen teaches processor 104 extracts data from each frame, e.g., overhead bytes and SPE content.” *Id.* at 19 (citations omitted).

Petitioner provides (*id.*) an annotated version of Cohen’s Figure 1, reproduced below:



Cohen’s Figure 1 illustrates an embodiment of its communication system, and this annotated version includes the annotation “Packetizer Receiving TDM frames” identifying the input to packetizer 100. Ex. 1005, 5:22–23.

Petitioner further explains that Cohen’s SONET frames include virtual tributaries (VT’s) having at least one unused VT, which Cohen describes as unequipped VTs. Pet. 20 (citing Ex. 1005, 1:24–3:3; Ex. 1003 ¶ 109).

Petitioner’s assertions are supported by the cited evidence. With respect to limitation [1.1], Patent Owner argues only that Cohen is admitted prior art and therefore cannot be applied against the challenged claims, an argument we have already determined above as unavailing.

We are persuaded that Cohen discloses limitation [1.1].

c) Limitation [1.2]

Claim 1 recites in limitation [1.2]: “determining whether the data comprise synchronous or non-synchronous data.” Ex. 1001, 19:8–9. The term “the data” has its antecedent basis in the payload carried by the time-division-multiplexed TDM input signal of limitation [1.1]. *Id.* at 19:3–9.

(1) Petitioner’s Contentions

Petitioner asserts that Cohen discloses limitation [1.2]. Pet. 21. Specifically, Petitioner asserts: “Cohen analyzes the format of each SONET frame’s C2-byte. Based on that analysis, Cohen determines whether the data in the SONET frame is synchronous or non-synchronous.” *Id.* Dr. Lavian explains: “It was understood in the art that each frame’s C2 byte refers to a SONET/SDH path layer overhead byte.” Ex. 1003 ¶ 114.

Petitioner explains:

[T]he Telecordia Technologies’ publication [Ex. 1011], which Cohen and the ’755 Patent each incorporates-by-reference, explains it was known in the art that C2-bytes are assigned hexadecimal values to refer to specific types of data. As shown below, this publication includes tables of various data-types corresponding to C2-bytes, e.g., Hex-04 corresponds to asynchronous mapping for SONET DS3 signals.

Pet. 21 (footnote citations omitted). The publication cited to by Petitioner, and incorporated by reference into the disclosure of Cohen, includes the following table:

Table 3-2. STS Path Signal Label Assignments	
Code (Hex)	Content of the STS SPE
00	Unequipped
01	Equipped – Nonspecific Payload
02	VT-Structured STS-1 SPE ^a
03	Locked VT Mode ^a
04	Asynchronous Mapping for DS3
12	Asynchronous Mapping for DS4NA
13	Mapping for ATM
14	Mapping for DQDB
15	Asynchronous Mapping for FDDI
16	HDLC-Over-SONET Mapping
FE	O.181 Test Signal (TSS1 to TSS3) Mapping ^b

Notes:

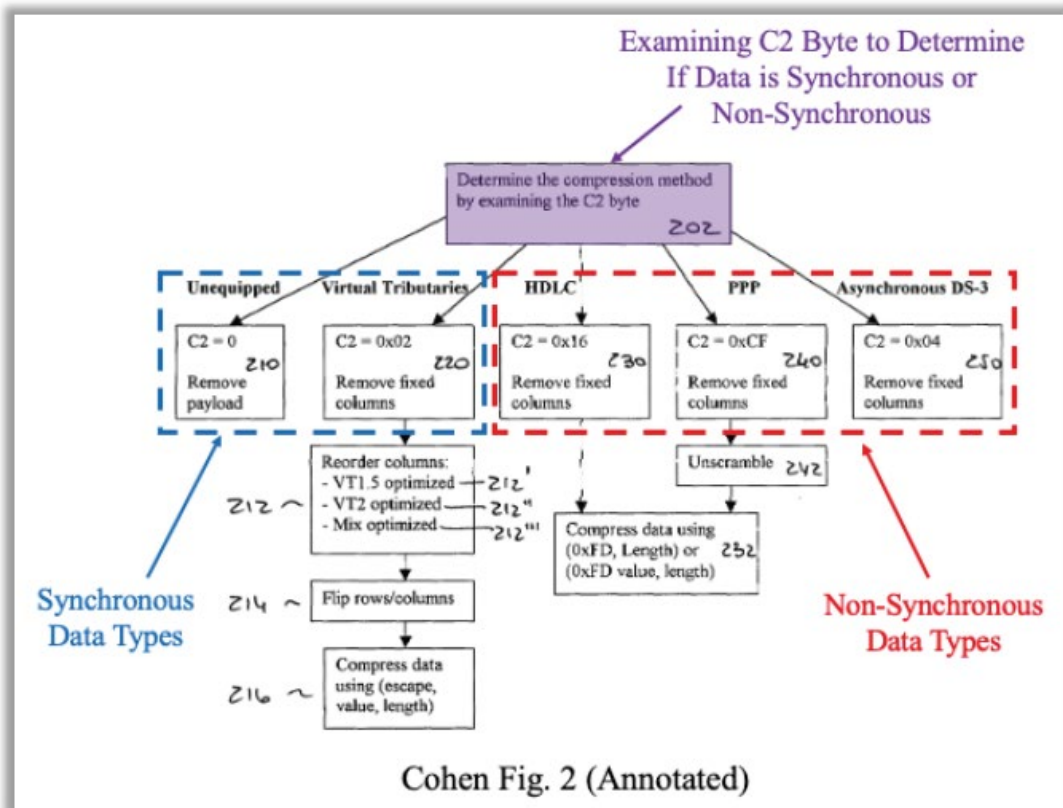
a In previous SONET standards and criteria documents, two modes were defined for VT-structured STS-1 SPEs. These were the Floating mode, which was assigned the code '02,' and the Locked mode, which was assigned '03.' The Locked VT Mode has since been removed from the SONET standards and criteria. However, for backward compatibility between future mappings and equipment that supports the Locked VT Mode, the signal label that was assigned to that mode remains defined.

b This code/mapping assignment is specified in ITU-T Rec. G.707 for use in SDH networks.

SONET Transport Systems: Common Generic Criteria, Table 3-2

This table shows hexadecimal values associated with the content of the STS SPE. Ex. 1011, 81. Dr. Lavian testifies that the C2-byte values of Hex-02, Hex-03, and Hex-14 indicate the SONET frame contains synchronous data. Ex. 1003 ¶ 115. Dr. Lavian further testifies that the C2-byte values of Hex-04, Hex-12, and Hex-13 indicate the SONET frame contains non-synchronous data. *Id.* ¶ 116. Dr. Lavian notes that the '755 patent acknowledges that prior art systems like Cohen use the C2-byte value to choose a compression algorithm to be applied to the payload data. *Id.* ¶ 114. Cohen expressly states: “In particular, each packetizer of the present invention provides different compression and/or decompression algorithms based on the SONET POH C2 signal label byte.” Ex. 1005, 6:10–12.

Petitioner provides an annotated version of Cohen's Figure 2 (Pet. 25), reproduced below:



Cohen's Figure 2 illustrates different compression algorithms used depending on the value contained in the C2 byte, and this annotated version includes annotations indicating "Synchronous Data Types" and "Non-Synchronous Data Types." Ex. 1005, 5:24–26.

Dr. Lavian testifies that a person of ordinary skill in the art would have understood that "frames comprise non-synchronous data when the receiver identifies PPP frames, HDLC frames, or asynchronous DS-3 data." Ex. 1003 ¶ 119. Dr. Lavian also testifies that a C2-byte value of "04," "16," and "CF," indicates the frame contains non-synchronous data. *Id.* Dr. Lavian also testifies that Unequipped block 210 indicates there is no

meaningful payload data, and that Virtual Tributaries C2=0x02 block 220 indicates synchronous data. *Id.* ¶¶ 115, 120.

According to Petitioner, Cohen discloses the determining step of limitation [1.2] by looking at the value of the C2 byte, with C2-byte code “0” indicating no meaningful data, C2-byte code “02” indicating synchronous data, and C2-byte codes (“04,” “16,” “CF”) indicating nonsynchronous data. Pet. 21, 25–26.

Notwithstanding Patent Owner’s arguments to the contrary, discussed below, Petitioner’s assertions are supported by the cited evidence. We are persuaded that Cohen discloses the step recited in limitation [1.2].¹²

(2) *Patent Owner’s Contentions and Our Analysis*

Patent Owner presents numerous arguments. PO Resp. 18–26. We address them in turn.

First, Patent Owner argues that the claim requires “a singular determination of synchronization of the data,” and Cohen makes five separate determinations on the C2 byte, which are then improperly lumped into two categories by Petitioner. *Id.* at 18. The argument is unavailing, because limitation [1.2] does not restrict how the determination of synchronous data or nonsynchronous data is made. A multi-step determination, one that checks various possibilities of the C2-byte content, is within the scope of limitation [1.2], so long as the outcome identifies the current data frame as comprising synchronous data or nonsynchronous data.

Second, Patent Owner argues that by examining the value of the C2 byte, Cohen does not make a determination of whether the data is

¹² Petitioner alternatively asserts that Cohen alone or Cohen in combination with Cao would have suggested limitation [1.2]. Pet. 27–32. We need not reach those contentions.

synchronous or nonsynchronous, “but instead discloses a classification of payload or protocol type (i.e., PPP, HDLC, etc.), not the data contained in the payload.” *Id.* at 20 (citing Ex. 2004 ¶¶ 49–54). Patent Owner asserts: “In the SONET standard, the purpose of the C2-byte is to communicate a payload type that the SONET Framing Over Head (FOH) encapsulates.” *Id.* (citing Ex. 2004 ¶ 37).

But limitation [1.2] does not limit the manner in which the payload data is determined to be synchronous or nonsynchronous, e.g., by excluding looking at the payload type indication in the C2 byte. In that connection, the specification of the ’755 patent conveys clearly that PPC frames and HDLC frames carry nonsynchronous payload data: “If the *payload comprises non-synchronous data, such as* IP packets, ATM cells, Frame Relay frames, *PPP frames or HDLC frames* (all of which are referred to generically herein as ‘packet data’), interface 42 passes the data to a packet data encapsulation module.” Ex. 1001, 10:45–49 (emphases added).

Further, Petitioner asserts that the ’755 patent also analyzes the C2 byte to determine whether the payload data is synchronous or nonsynchronous. Reply 4. Patent Owner asserts that “[t]he ’755 patent does not use the C2 byte to make the determination between synchronous and nonsynchronous data.” Sur-Reply 2. With respect to how the ’755 Patent determines whether the payload data is synchronous or nonsynchronous, Patent Owner explains:

In contrast, the ’755 Patent describes how it determines synchronous vs. non-synchronous data using, in one embodiment, a TDM interface that analyzes the data stream. Fig. 2; 10:7–32. Specifically, the ’755 describes that “[t]he TDM interface thus receives a stream of STS-1 or STS-Nc frames, which may contain payload data of various types.” 10:18–20. *See also*, 18:28–37 (“Interfaces 180 and 182 identify the payload

data they receive as either synchronous or nonsynchronous data.”[)] *Id.* at 18:9–11.

Id. at 3. Patent Owner’s explanation merely identifies which components perform the determination and does not inform how interfaces 180 and 182 perform the determination. It is unclear just how interfaces 180 and 182 determine whether the payload data is synchronous or nonsynchronous. That, however, is inconsequential because, as noted above, limitation [1.2] does not restrict the manner in which the determination is made, such as by examining the code contained within the C2 byte.

Third, Patent Owner disputes that payload data types PPP, HDLC, and Asynchronous DS-3, indicates the payload data is nonsynchronous.

PO Resp. 23–24. Patent Owner asserts:

Yet, a [person of ordinary skill in the art] would recognize that a C2 byte value indicating an HDLC, or PPP payload does not provide an indication of whether the data is synchronous or not. *See* EX2004 at ¶¶49–59. Rather, HDLC and PPP frames both can contain synchronous and nonsynchronous data. *Id.* Despite Dr. Lavian categorizing HDLC as non-synchronous, at least one of Petitioner’s other references, Lewin, describes HDLC data as synchronous: “[t]he HDLC frame is synchronous and relies on the physical layer for clocking and synchronization of the transmitter and receiver.” EX1009 at 10:1–3; *see also* EX2004 at ¶53 (“HDLC contains both synchronous and non-synchronous data”); *N.B.* EX2007. With respect to PPP, the IETF standard RFC-2615 referenced in Cohen, contradicts Dr. Lavian’s classification of PPP as exclusively non-synchronous: “PPP treats SONET/SDH transport as octet oriented synchronous links. SONET/SDH links are full-duplex by definition.” EX1005 at 13:5–11; EX2006, 3. Accordingly, Petitioner’s annotations of the alleged “Synchronous Data Types” and “Non-Synchronous Data Types” on Figure 2 of Cohen are misleading and a POSITA would not view the data types in this manner. EX2004 at ¶¶55–56.

Id. According to Patent Owner’s expert, Dr. Akl, “HDLC contains *both synchronous and nonsynchronous data* and can be transmitted over either asynchronous or synchronous communication links.” Ex. 2004 ¶ 53 (emphasis added). Also according to Dr. Akl, PPP “contains **both synchronous and non-synchronous** data.” *Id.* ¶ 54.

We do not understand how data can at once be both synchronous and nonsynchronous. We asked counsel for Patent Owner what it means by each of PPP and HDLC data is both synchronous and nonsynchronous, and counsel for Patent Owner clarified by saying that by “both,” Patent Owner means “either.” Tr. 16:25–17:8. In its Reply, Petitioner does not dispute Patent Owner’s assertion in the Patent Owner Response that each of PPP and HDLC technically can be either synchronous data or nonsynchronous data. Dr. Lavian, in his supplemental declaration, explains:

Cohen further identifies incoming PPP and HDLC data as comprising nonsynchronous. In the context of its system, Cohen specifies that PPP and HDLC data frames primarily comprise nonsynchronous data. For example, Cohen specifically identifies RFC1662 for further discussion of HDLC compression methods, which I understand both the Patent Owner and Dr. Akl don’t address. RFC1662 is titled “PPP in HDLC-like Framing,” and specifies that consideration of synchronous transmissions are “outside the scope of this specification.” A POSITA would understand that Cohen’s discussion of HDLC and PPP is primarily relates to non-synchronous data. In this respect, Cohen’s teachings parallel the disclosures of the ’755 Patent, which consistently refer to HDLC and PPP data frames as being nonsynchronous. While PPP and HDLC data could contain synchronous data in limited scenarios unrelated to Cohen’s method and the ’755 Patent’s method, a POSITA would understand that Cohen’s teachings instruct that the PPP and HDLC data frames at issue are primarily related to non-synchronous transmissions.

Ex. 1033 ¶ 13 (citations omitted).

Regardless of whether in circumstances not related to the invention described in the '755 patent, PPP and HDLC payload data may be synchronous data, the '755 patent conveys clearly that in the context of the '755 patent, a PPP or HDLC data type designation in the C2 byte indicates nonsynchronous data:

If the payload comprises non-synchronous data, such as IP packets, ATM cells, Frame Relay frames, PPP frames or HDLC frames (all of which are referred to generically herein as “packet data”), interface 42 passes the data to a packet data encapsulation module 46. This module also receives the packet data input to ITD 22 via packet interface 40. Module 46 encapsulates the data in a manner that is not dependent on the synchronization of the input data.

Ex. 1001, 10:45–53 (emphases added). This description clearly and unambiguously identifies PPP frames and HDLC frames as carrying nonsynchronous payload data. Other descriptions in the specification, including claim 3 of the '755 patent, are consistent with that understanding:

Typically, the synchronous data include voice data, while the non-synchronous data include at least one data type selected from a group of data types consisting of Asynchronous Transfer Mode (ATM) cells, Internet Protocol (IP) packets, Frame Relay (FR) frames, High-Level Data Link Control (HDLC) frames, Point-to-Point Protocol (PPP) frames, Ethernet frames and Generic Framing Procedure (GFP) frames.

Id. at 5:37–43.

At least some of the payload data typically comprises synchronous payloads, such as voice signals transmitted over DS1 lines of a PDH network. Other payload data received by TDM interface 42 may comprise packet data carried over TDM networks, such as Frame Relay, PPP, HDLC or Generic Framing Procedure (GFP) frames carried over DS1 lines, as well as ATM cells and IP packets transported over SONET lines in the TDM network.

Id. at 10:20–27.

3. The method according to claim 1, wherein the nonsynchronous data comprise at least one data type selected from a group of data types consisting of Asynchronous Transfer Mode (ATM) cells, Internet Protocol (IP) packets, Frame Relay (FR) frames, High-level Data Link Control (HDLC) frames, Point-to-Point (PPP) frames, Ethernet frames and Generic Framing Protocol (GFP) frames.

Id. at 19:20–26.

Because the specification of the '755 patent clearly regards PPP frames as containing nonsynchronous data, for purposes of this proceeding and in the context of the '755 patent, a C2-byte value indicating a PPP frame data type does convey that the payload data in the frame is nonsynchronous. Similarly, because the specification of the '755 patent clearly regards HDLC frames as containing nonsynchronous data, for purposes of this proceeding and in the context of the '755 patent, a C2-byte value indicating an HDLC frame data type does convey that the payload data in the frame is nonsynchronous. The '755 patent specification regards a PPP frame and an HDLC frame as carrying nonsynchronous data and not synchronous data.

As for a C2-byte value indicating Asynchronous DS-3 data type, Patent Owner asserts “the '755 Patent makes clear and as Dr. Lavian acknowledged ‘DS-3 signals may carry either synchronous or non-synchronous (packet) data.’ *E.g.*, EX1001 at 17:45–46 (emphasis added); EX2005 at 79:22–80:17.” The assertion and argument is misplaced. Neither the '755 patent nor Dr. Lavian has stated that “Asynchronous DS-3” data type identifies either synchronous or nonsynchronous data. Specifically, the '755 patent states that “DS-3” signals may carry either synchronous or nonsynchronous data, not that “Asynchronous DS-3” signals may carry either synchronous data or nonsynchronous data. Ex. 1001, 17:45–46. Similarly, Dr. Lavian, on cross-examination, testified that “DS-3” signals

can be either synchronous or nonsynchronous, not that “Asynchronous DS-3” signals may carry either synchronous data or nonsynchronous data.

Ex. 2005, 79:22–80:17.

Further, Patent Owner does not point to any testimony from its own expert, Dr. Akl, stating that “Asynchronous DS-3” data type in the C2 byte indicates either synchronous data or nonsynchronous data. We credit Dr. Lavian’s testimony: “As I explained in my initial declaration, Asynchronous DS-3 is by its nature non-synchronous.” Ex. 1033 ¶ 20 (citing Ex. 1003 ¶ 119). In that regard, we see that the term “Asynchronous” leads the phrase “Asynchronous DS-3.”

(3) *Conclusion*

For the foregoing reasons, we are persuaded that Cohen discloses limitation [1.2].¹³ The three paths in Cohen’s annotated Figure 2 reproduced above, leading to the HDLC box, the PPP box, and the Asynchronous DS-3 box, constitute determinations that the payload data is nonsynchronous. The three paths are not active or triggered at the same time for the same data frame. Rather, the activation or triggering of any path indicates the data is nonsynchronous data. Further, the one path in Cohen’s annotated Figure 2 reproduced above, leading to the Virtual Tributaries box, constitutes a determination that the payload data is synchronous data.¹⁴

¹³ We need not address Petitioner’s argument, raised for the first time in the Reply, that the identification of PPP and HDLC frames based on the C2-byte can be ignored and Petitioner still has shown Cohen teaches limitation [1.2] by identification of nonsynchronous data through checking the Asynchronous DS-3 Code in the C2-byte and by identification of synchronous data through checking the Virtual Tributaries Code in the C2-byte. Reply 10–11.

¹⁴ As noted above, the Unequipped box to the left in Cohen’s annotated Figure 2 reproduced above represents the situation where there is no

d) Limitation [1.3]

Claim 1 recites in limitation [1.3]: “selecting a first encapsulation scheme if the data comprise synchronous data, and a second encapsulation scheme if the data comprise non-synchronous data, wherein the selected encapsulation scheme includes suppression of the at least one unused VT.” Ex. 1001, 19:10–14. Petitioner asserts: “Cohen discloses this element or renders it obvious alone or in view of Malis.” Pet. 32.

For reasons discussed below, we are not persuaded that Cohen alone teaches or reasonably suggests limitation [1.3]. However, notwithstanding contrary arguments of Patent Owner, we are persuaded that the combined teachings of Cohen and Malis reasonably would have suggested to one with ordinary skill in the art limitation [1.3].

(1) Cohen Alone

Petitioner explains, referring to elements in Cohen’s Figure 2:

Cohen teaches its receiver includes packetizer 100. Cohen’s packetizer includes modules 106, 108 that compress the synchronous or non-synchronous data and encapsulates [sic] the compressed data in a packet:

SONET processor then forwards the SPE bytes to a Compressor 106, in which the payload is compressed using an algorithm suitable for the specific SONET STS-1 payload, and selected by the C2 byte. . . . *Next follows an encapsulation step done by a Packet Processor 108 in which the compressed payload is encapsulated in a packet.* The SPE payload may be carried over a single packet, but may be transported on top of multiple packets when necessary.

meaningful data in the payload. Ex. 1005, 9:30–10:2. The parties have no dispute in that regard.

Pet. 33 (quoting Ex. 1005, 6:25–7:2) (alteration by Petitioner). Petitioner further notes that the provisional application to which the Cohen claims priority, Provisional Application 60/292,952 (Ex. 1015), which is incorporated by reference into the disclosure of Cohen, likewise discloses that the SONET payload data is first compressed and then encapsulated. *Id.* (citing Ex. 1015, 4).

Regarding differentiation between synchronous data and non-synchronous data for encapsulation, Petitioner explains:

Further, Cohen describes multiple exemplary encapsulation schemes that mirror those discussed in the '755 Patent, e.g.,:

- Cohen encapsulates non-synchronous SPE payload without aligning the payload to start following the J1 POH-byte [(citing Ex. 1005, 7:29–8:2)];
- Cohen describes an encapsulation scheme having payload error monitoring for frames containing non-synchronous payloads, e.g., IP data [(citing Ex. 1005, 8:3–14)]; and
- Cohen describes an encapsulation scheme adding a frame check sequence (“FCS”) trailer for non-synchronous payloads, e.g., PPP data [(citing Ex. 1005, 13:5–9)].

Based on these teachings, a [person of ordinary skill in the art] would have understood Cohen discloses or alone renders obvious selecting an encapsulation scheme for the frames that include synchronous data, e.g., T1-voice data, and another encapsulation scheme if the data comprise non-synchronous data, e.g., PPP data [(citing Ex. 1003 ¶ 139)].

Id. at 34–35 (footnotes omitted).

Thus, according to Petitioner, the particular disclosure about schemes to adopt when the data is non-synchronous implies that the schemes are not

adopted when the data is synchronous, and that disclosure is by implication or inference. In that regard, we note that the pertinent inquiry takes into account the literal teachings of the prior art reference, and inferences the ordinarily skilled person would draw from it. *Eli Lilly & Co. v. L.A. Biomedical Res. Inst. at Harbor-UCLA Med. Ctr.*, 849 F.3d 1073, 1074–75 (Fed. Cir. 2017). The dispositive question is whether one with ordinary skill in the art reasonably would have understood or inferred from the prior art reference the limitation at issue. *See In re Baxter Travenol Labs.*, 952 F.2d 388, 390 (Fed. Cir. 1991). Alternatively, Petitioner’s position is that disclosure of specific schemes just for nonsynchronous data reasonably would have suggested a different scheme for synchronous data. Pet. 35. Both positions depend on Cohen’s described schemes are just for nonsynchronous data.

Petitioner further explains that for synchronous data, Cohen suppresses unused VTs via a three-stage compression algorithm that removes fixed columns and reorders columns, and that for non-synchronous data, Cohen suppresses unused VTs using an HDLC, PPP, or Asynchronous DS-3 compression algorithm that removes unused columns and rows. Pet. 35 (citing Ex. 1005, 3:24–5:15, 9:3–17:5; Ex. 1003 ¶¶ 137, 139).

Patent Owner asserts that none of the three exemplary encapsulation schemes identified by Petitioner as disclosed in Cohen is just for encapsulating nonsynchronous data. PO Resp. 32–33. Patent Owner states: “The sum total of Cohen’s disclosure regarding encapsulation is merely passing references that are not based on whether the data is synchronous or nonsynchronous.” *Id.* at 33.

We have reviewed the cited portions of Cohen. The exemplary encapsulation schemes in Cohen, as identified by Petitioner, have not been

shown by Petitioner as just for encapsulating nonsynchronous data. We find it is unclear whether they are used only for encapsulating nonsynchronous data. Cohen is ambiguous in that regard. It is uncertain whether those schemes preserve or do not preserve data synchronization. The record evidence is insufficient to support a finding either way, that Cohen's schemes are only for nonsynchronous data or that Cohen's schemes are for both synchronous data and nonsynchronous data.

We agree with Patent Owner that Cohen does not describe the encapsulation schemes identified by Petitioner as applicable just to nonsynchronous data. In its Reply, Petitioner does not make a counter-argument in that regard, e.g., to point out or explain why Petitioner's assertion is correct and Patent Owner's assertion is incorrect.¹⁵ The Petition also provides no reason why Cohen reasonably would have suggested to one of ordinary skill in the art using the exemplary encapsulation schemes just for nonsynchronous data.

For the foregoing reasons, we are not persuaded by Petitioner that Cohen itself discloses or reasonably would have suggested limitation [1.3].

(2) *Cohen and Malis*

Petitioner, however, presents an alternative theory to account for limitation [1.3], one that is based on the combined teachings of Cohen and Malis. Pet. 36. According to the alternative theory, one with ordinary skill in the art would look outside of Cohen, if Cohen itself is deficient, for an

¹⁵ Instead, Petitioner in its Reply makes a new argument, not previously presented, that because each individual data path based on a different C2-byte code leads to a uniquely corresponding encapsulation scheme, limitation [1.3] is met by Cohen. Reply 9, 18. This is a belated new argument not entitled to consideration. *See Intelligent BioSys., Inc. v. Illumina Cambridge Ltd.*, 821 F.3d 1359, 1369–70 (Fed. Cir. 2016).

encapsulation scheme to apply to synchronous data. *See id.* Petitioner explains that based on Malis’s teachings, one with ordinary skill in the art would have known to select a particular encapsulation scheme if the data includes synchronous data. *Id.* at 40. “A [person of ordinary skill in the art] would have been motivated to do so because this would allow Cohen to encapsulate synchronous SONET signals for transmission across PSNs networks supporting MPLS and IP.” *Id.* (citing Ex. 1007, 1–2, 5–6). For reasons discussed below, we are persuaded that the combined teachings of Cohen and Malis satisfy the requirements of limitation [1.3].

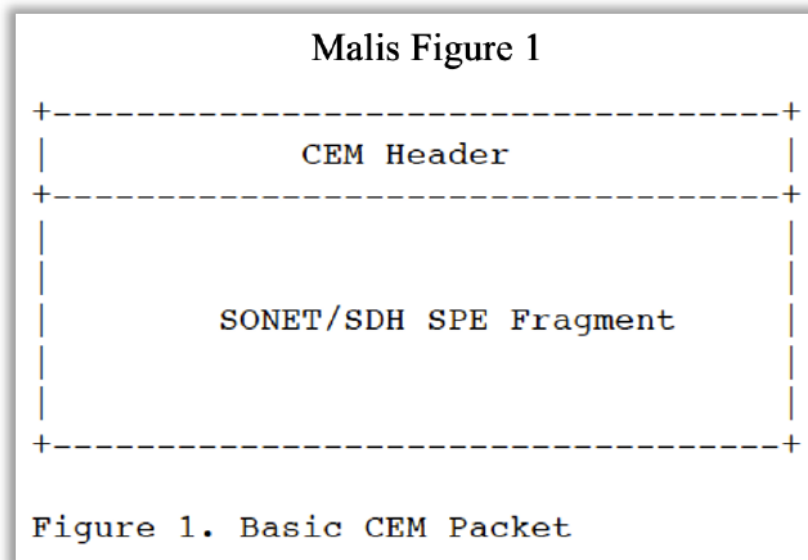
Petitioner asserts that Malis teaches encapsulating TDM signals “having synchronous data” using a circuit emulation service (“CES”) encapsulation scheme. *Id.* at 36 (citing Ex. 1007, 2–3; Ex. 1003 ¶¶ 140–141). Petitioner relies on Malis to teach an encapsulation scheme which is usable to encapsulate synchronous data. *Id.* at 36–41. On that basis, Petitioner contends that in light of Cohen and Malis, it would have been obvious to one with ordinary skill in the art to use Malis’s encapsulation scheme if the data is synchronous data and Cohen’s encapsulation scheme if the data is non-synchronous data. *Id.* at 41.

Patent Owner does not dispute the exemplary encapsulation schemes of Cohen are usable for encapsulating nonsynchronous data. Given the ambiguity in Cohen of what scheme is used for encapsulating synchronous data, we agree with Petitioner that one with ordinary skill would have considered Malis’s disclosure. As discussed below, Petitioner has shown a reason for one with ordinary skill in the art to use Malis’s encapsulation scheme for encapsulating synchronous data. Patent Owner acknowledges that Malis “only has an encapsulation scheme for synchronous data.” PO Resp. 46. Therefore, Cohen and Malis collectively teach limitation [1.3],

i.e., selecting a first encapsulating scheme if the data comprises synchronous data, and selecting a second encapsulating scheme, a scheme already disclosed in Cohen, if the data comprises nonsynchronous data.

According to Petitioner, “Malis teaches encapsulating TDM signals having synchronous data using a circuit emulation service (‘CES’) encapsulation scheme.” Pet. 36 (citing Ex. 1007, 2–3; Ex. 1003 ¶¶ 140–141). Petitioner explains:

Malis teaches breaking *synchronous* payload envelopes (“SPEs”) into fragments and *encapsulating each fragment* in an output packet by pre-pending a Circulation Emulation Service over MPLS (‘CEM’) header *for transport in synchronization with the payload of the TDM-input signal* (i.e., SONET/SDH SPE Fragment in below Fig. 1).



[Figure 1 illustrates a basic CEM data packet. Ex. 1007, 3] Pet. 36–37 (emphasis added) (citing Ex. 1007, 3; Ex. 1003 ¶ 142). The assertion is supported by the testimony of Dr. Lavian. Ex. 1003 ¶ 142. Dr. Lavian further explains:

During normal operation, the CEM packetizer will receive a *fixed rate byte stream* from a SONET/SDH interface. When a packets worth of data has been received from a SONET/SDH channel, the CEM Header, the VC Label, and PSN Header are pre-pended to the SPE fragment and the resulting CEM packet is transmitted into the packet network.

Id. (emphasis added) (citing Ex. 1007, 8). Patent Owner acknowledges that Malis “only has an encapsulation scheme for synchronous data.” PO Resp. 46. We find that Malis’s disclosure of receiving a *fixed rate data stream* and of *transporting encapsulated fragments in synchronization* indicates an encapsulation scheme for synchronous data, one that preserves synchronization.

Patent Owner makes several counter-arguments, which we address in turn. First, Patent Owner asserts:

Malis does not teach or suggest different encapsulation schemes depending on the data type of the payload. Indeed, Malis states a uniform encapsulation as its goal. EX1007, p.5 (“It is highly desirable to define a single encapsulation format that will work for both IP and MPLS. Furthermore, it is desirable that the encapsulation mechanism be as efficient as possible.”) The ’755 Patent confirms this deficiency in Malis:

The CEP protocol described by Malis et al. provides a method for emulating the key elements of traditional SONET/SDH SPE services across a packet-switched network, **without making any assumptions** about the contents of the SPE. It is therefore applicable to emulation of SONET and SDH circuits **carrying any type of payload.**”

Ex. 1001 at 2:55–60 (emphasis added).

Id. at 34. Patent Owner summarizes by stating that even if one of ordinary skill did make the combination of Cohen and Malis, “[the combination still would not teach or suggest claim element 1.3, because Malis applies encapsulation irrespective of whether the data is synchronous and therefore

does not teach or suggest the '755 Patent's adaptive encapsulation scheme.”
Id. at 35.

Patent Owner's argument is misplaced. One may not attack prior art references individually when the alleged unpatentability is based on a combination of references. *In re Merck & Co., Inc.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986). Petitioner looks to Malis only to find an encapsulation scheme that preserves data synchronization so that it may be used in Cohen for encapsulating synchronous data. Cohen already discloses encapsulation schemes which both parties agree are usable for nonsynchronous data. In this context, Malis itself does not have to teach different encapsulation schemes for synchronous and nonsynchronous data.

Also, even if use of a single encapsulation scheme is the goal of Malis, Patent Owner's argument still is unavailing, because a prior art reference must be considered for everything it teaches by way of technology and is not limited to the particular invention it is describing and attempting to protect. *EWP Corp. v. Reliance Universal Inc.*, 755 F.2d 898, 907 (Fed. Cir. 1985); *accord In re Heck*, 699 F.2d 1331, 1333 (Fed. Cir. 1983). One of ordinary skill in the art need not implement in Cohen every described feature or goal of Malis. Patent Owner has not identified applicable authority that requires an “all or none” approach to applying the teachings of a prior art reference, and we are aware of none.

Additionally, Patent Owner's reliance on a description within the specification of the '755 patent about a “Malis et al.” publication (PO Resp. 34) is inaccurate, because that “Malis et al.”¹⁶ (Ex. 1012) is a different

¹⁶ Malis et al., *SONET/SDH Circuit Emulation over Packet (CEP)*, IETF draft-ietf-pwe3-sonet-00.txt (July 2002). Ex. 1012; *see* Ex. 1001, 2:49–53.

publication from the prior art reference Malis (Ex. 1007) applied by Petitioner. Petitioner similarly miscites to the specification of the '755 patent as stating something about the disclosure of Malis: "The '755 Patent acknowledges it was known to a POSITA that Malis co-authored multiple IEFT publications teaching CES encapsulation schemes for encapsulating *synchronous* data." Pet. 40 (citations omitted). The specification of the '755 patent does not specifically describe any content of the prior art reference Malis (Ex. 1007) applied by Petitioner.

Patent Owner further argues that one with ordinary skill in the art would not have had motivation to combine Cohen and Malis. PO Resp. 35–36. According to Patent Owner, Petitioner identified only the following motivations for combining Cohen and Malis: (1) "Cohen and Malis are in the same field of endeavor (Pet. at 14)"; and (2) "Cohen and Malis both encapsulate data (Pet. at 15)." *Id.* at 36. Patent Owner states that generic explanations of how Cohen and Malis share some similarities are insufficient. *Id.* at 38. We agree with Patent Owner that generic similarities are insufficient. However, these generic similarities are not the main reason relied on by Petitioner for one with ordinary skill in the art to look to and adopt the encapsulation scheme disclosed in Malis.

As discussed above, the Cohen and Malis combination is Petitioner's alternative theory of obviousness, one that Petitioner relies on if Cohen itself is not sufficient to account for a particular encapsulation scheme for synchronous data. We have determined above that Petitioner has not sufficiently shown that Cohen itself discloses or reasonably would have suggested a particular encapsulation scheme for synchronous data, and that Cohen is ambiguous with regard to what encapsulation scheme is used for synchronous data. Here, Petitioner's main reason to look outside of Cohen

is to find an encapsulation scheme usable to encapsulate synchronous data. In that regard, Petitioner states: “A [person of ordinary skill in the art] would have been motivated to do so because this would allow Cohen to encapsulate synchronous SONET signals for transmission across PSN networks supporting MPLS and IP. This would further Cohen’s desire to transport SONET signals across packet-switched networks.” Pet. 40.

We see nothing wrong with that motivation to look to Malis. It is specific and not overly general. Patent Owner has over-simplified Petitioner’s reasoning by noting only that Petitioner explains that both Cohen and Malis are in the same field of endeavor and that both Cohen and Malis encapsulate data. Those assertions by Petitioner are supportive of Petitioner’s reasoning but are not the primary basis to look to Malis, which is to find an encapsulating scheme specifically useful for encapsulating synchronous data, one that preserves data synchronization. Patent Owner does not dispute that Malis discloses an encapsulation scheme usable for encapsulating synchronous data. Patent Owner states that Malis “only has an encapsulation scheme for synchronous data.” POREsp. 46.

Patent Owner argues that Cohen and Malis are seeking to solve different problems in unrelated ways. *Id.* at 39. Patent Owner asserts that Cohen is focused on compressing data payloads to save bandwidth, while Malis does not disclose encapsulating synchronous and nonsynchronous data with different encapsulating schemes. *Id.* at 37. The argument is misplaced, because it is not a precondition to combining reference teachings that the references be focused on solving the same problem and because the teachings of Cohen and Malis, as applied by Petitioner, are not unrelated.

For instance, Cohen does not describe a specific scheme for encapsulating synchronous data but needs one, and Malis describes such a

scheme. Further, as we discussed above, it matters not that Malis may use the same scheme to encapsulate both synchronous and nonsynchronous data, because a prior art reference must be considered for everything it teaches by way of technology and is not limited to the particular invention it is describing and attempting to protect. *See EWP Corp.*, 755 F.2d at 907.

Patent Owner asserts that because Petitioner states that Malis provides the same functionality or solution as Cohen, there is no reason to add Malis when the “motivation” was purportedly already solved by Cohen. PO Resp. 37 (citing Pet. 35–37). Evidently, Patent Owner is referring to Petitioner’s first theory that Cohen alone already discloses a scheme suitable for encapsulating synchronous data. The argument is unavailing, because Petitioner presents two alternative theories of obviousness. We discussed Petitioner’s first theory and are not persuaded thereby. In considering Petitioner’s alternative theory, we do not assume that Cohen alone already provides a scheme suitable for encapsulating synchronous data.

Patent Owner argues that neither the Petition nor Dr. Lavian addresses why there would have been a reasonable expectation of success in combining the teachings of Cohen and Malis. PO Resp. 39–40. Specifically, Patent Owner asserts:

Cohen’s encapsulation scheme is designed at efficiency after compression. EX1005, 7:25–32. This compression method is done via examination of the C2 byte. *Id.* at 3:9–13. Contrasting this, Malis does not examine the C2 byte. Malis in fact mentions the C2 byte *once*. In order to combine Malis with Cohen, a POSITA [person of ordinary skill in the art] would have to redesign Cohen’s encapsulation scheme to add an additional encapsulation step. Further, as Petitioner alleges Malis’s encapsulation is based upon synchronous/non-synchronous data, a POSITA would have to redesign Cohen to determine and sort synchronous/non-synchronous data types, as opposed to

examining the C2 byte based off the payload for efficient compression. EX2004 at ¶¶93–94. As a result, a POSITA would have to conduct significant experimentation and modifications to create a working system that adopted modifications from Cao or Malis. *Id.* Petitioner and its expert fail to put forward any evidence to demonstrate how this proposed reconfiguration or combination would work together. *Samsung Elecs.*, 925 F.3d at 1380–81.

Petitioner appears to assume success, and assumptions do not suffice.

Id. at 42–43. For reasons discussed below, Patent Owner’s arguments are misplaced and unavailing.

First, as discussed above, the motivation for one with ordinary skill to look to Malis simply is to find an encapsulation scheme that preserves data synchronization, so that it can and would be used in Cohen for encapsulating synchronous data. Whether Malis examines the C2 byte for any purpose is inconsequential. Also, that Malis’s encapsulation scheme preserves data synchronization is not disputed by Patent Owner.

Second, no redesign of Cohen to add an encapsulation step is needed, because Cohen itself already describes that there is an encapsulation step after data compression. Following its description that Compressor 106 compresses the data payload using an algorithm selected by the C2 byte, Cohen specifically states: “Next follows an encapsulation step done by a Packet Processor 108, in which the compressed payload is encapsulated in a packet.” Ex. 1005, 7:31–32. Consistent with that disclosure, Patent Owner in its Response acknowledges that Cohen describes an encapsulation step subsequent to the compression step, and produces the following color-annotated Figure 2 of Cohen (PO Resp. 31):

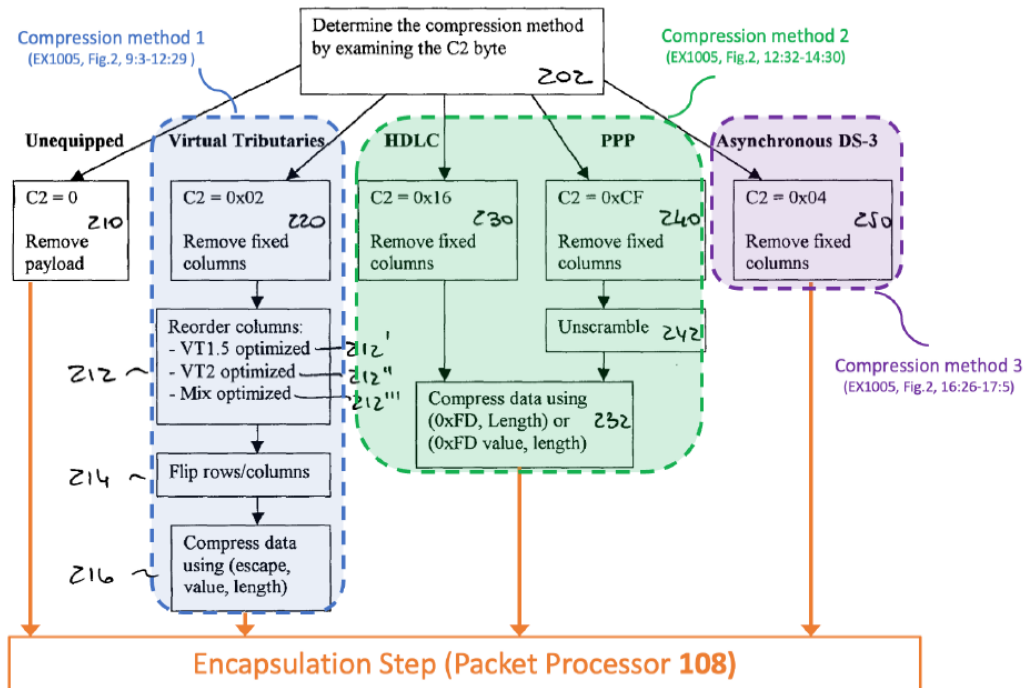


FIG. 2

Cohen's Figure 2 illustrates different compression algorithms used depending on the value contained in the C2 byte, and this annotated version by Patent Owner illustrates the subsequent encapsulation step. Ex. 1005, 5:24–26.

Third, contrary to Patent Owner's suggestion, at the stage post compression and prior to encapsulation, no further determination of whether the payload data is synchronous or nonsynchronous is necessary because, as we discussed above, the examination of the C2 byte for selecting a compression algorithm already ascertained whether the data is synchronous or nonsynchronous. The data flow path chosen on the basis of that determination reflects not only selection of the compression algorithm but also the encapsulation scheme that follows the data compression, which is configured on the same data path.

There is nothing more to reconfigure or redetermine, and there is no reason to expect the encapsulation scheme described in Malis would not

work in Cohen when used to encapsulate synchronous data such as that shown above in the Virtual Tributaries data flow path. The assertion of lack of showing of reasonable expectation of success has no reasonable support on this record and is based on Patent Owner's incorrect contention that examination of the C2 byte does not determine whether the data is synchronous or nonsynchronous.

In its Sur-Reply, Patent Owner argues that in the claimed invention, the "determination" step must occur prior to the "selection" step. Sur-Reply 5. It appears to be an improper new argument raised for the first time in the Sur-Reply. Nevertheless, the argument is unavailing because, as discussed above, we disagree with Patent Owner's assertion that Cohen's examination of the C2 byte does not determine whether the data is synchronous or nonsynchronous. We explained above that Petitioner has shown Cohen's examination of the C2 byte does determine whether the data is synchronous or nonsynchronous. That determination does precede the selection of an encapsulation scheme because, as explained above, the determination results in selection of a data flow path and that data flow path includes application of a particular compression algorithm and a particular encapsulation scheme. The selection of the data flow path, which follows the determination of whether the data is synchronous or nonsynchronous, selects both a compression algorithm and an encapsulation scheme.

For the foregoing reasons, we are persuaded by Petitioner that Cohen and Malis, as combined by Petitioner, collectively teach limitation [1.3].

e) Limitation [1.4]

Claim 1 recites in limitation [1.4]: "encapsulating the data for transmission over a packet-switched network in accordance with the selected encapsulation scheme." Ex. 1001, 19:15–17. Petitioner asserts:

Cohen discloses this element. As shown for element 1.3 and the preamble, Cohen encapsulates data for transmission over PSN 120 based on a selected encapsulation scheme that includes compression. For instance, Cohen compresses data then encapsulates that data in a packet.

Further, Cohen specifies its method “packetize[s] SONET/SDH stream for transmission over a packet switched network.”

Pet. 41 (footnote citations omitted) (alteration by Petitioner). Cohen states: “Next follows an encapsulation step done by a Packet Processor 108, in which the compressed payload is encapsulated in a packet.” Ex. 1005, 6:31–32. Cohen also states that it provides a method for compressing a packetized SONET/SDH stream for transmission over a packet switched network. *Id.* at 3:9–13.

Petitioner’s assertions are supported by the cited disclosure of Cohen. With respect to Cohen and limitation [1.4], Patent Owner argues only that Cohen is admitted prior art and therefore cannot be applied against the challenged claims, an argument we have already determined above as unavailing. We are persuaded that Cohen discloses limitation [1.4].

f) Conclusion

Petitioner has proven, by a preponderance of the evidence, that claim 1 would have been obvious over Cohen, Cao, and Malis.

5. Dependent Claims 2–20

Claims 2–20 each depend, directly or indirectly, from claim 1, and thus include all of the limitations of claim 1.

a) Claim 2

Claim 2 further recites: “wherein the synchronous data comprise voice data.” Ex. 1001, 19:18–19. Petitioner asserts that it was general knowledge in the art that SONET was designed to carry synchronous data

such as voice data, and also that Malis teaches that synchronous SONET data includes voice data. Pet. 42 (citing Ex. 1001, 2:17–20; Ex. 1003 ¶ 158; Ex. 1007, 2). The assertions are supported by the cited evidence.¹⁷

Patent Owner has not asserted, for claim 2, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Further, here, the teaching relied on from Malis simply is that synchronous SONET data can be voice data. No reconfiguration or modification of Cohen’s disclosed device is at issue. Also, Petitioner has sufficiently established that it was well known to one with ordinary skill in the art that SONET was designed to carry synchronous data such as voice data, and thus reliance on Malis is not necessary.

Petitioner has proven, by a preponderance of the evidence, that claim 2 would have been obvious over Cohen, Cao, and Malis.

b) Claims 3–7 and 9

Claims 3, 4, 6, and 9 each depend from claim 1. Ex. 1001, 19:20–29, 19:37–39, 19:52–54. Claim 5 depends from claim 4 and claim 7 depends from claim 6. *Id.* at 19:30–36, 19:40–44.

Claim 5 recites:

wherein receiving the SDH signal comprises receiving a structured SDH signal containing a PDH signal belonging to a Plesiochronous Digital Hierarchy (PDH), and wherein encapsulating the data comprises recovering the PDH signal from the structured SDH signal, and encapsulating the data in the payload of the PDH signal.

¹⁷ It is appropriate to rely on acknowledgment in the involved patent of what was well known in the art. *Qualcomm*, 24 F.4th at 1376.

Id. at 19:30–36. Claim 6 recites: “wherein receiving the TDM input signal comprises receiving a signal belonging to a Plesiochronous Digital Hierarchy (PDH).” *Id.* at 19:37–39.

Petitioner specifically addresses the features added by claims 5 and 6. Pet. 43–44. Dr. Lavian testifies that it was generally known in the art that SONET lines also commonly carry traffic belonging to a PDH and that it was generally known in the art that PDH signals operated at a DS-3 level. Ex. 1003 ¶¶ 169, 175 (citing Ex. 1001, 1:15–18, 1:50–51, 17:22–58, 18:9–27).¹⁸ Dr. Lavian also testifies that one with ordinary skill in the art “would have understood that Cohen discloses or suggests supporting TDM input signals that include SDH signals which contain PDH signals.” *Id.* ¶ 170. Dr. Lavian further testifies that “it was generally known in the art that CES encapsulation schemes allow for transmission of PDH signals over packet-switched networks.” *Id.* ¶ 171.

Petitioner asserts: “Malis’[s] teachings toward CES encapsulation render obvious receiving a PDH signal, recovering PDH signals from structured SDH signals, and encapsulating data in the PDH signal’s payload.” Pet. 44 (citing Ex. 1003 ¶¶ 170–172, 176–178). Petitioner’s assertions are supported by the cited evidence.

Patent Owner has not asserted, for claims 5 and 6, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that each of claims 5 and 6 would have been obvious over Cohen, Cao, and Malis.

¹⁸ It is appropriate to rely on acknowledgment in the involved patent of what was well known in the art. *Qualcomm*, 24 F.4th at 1376.

Petitioner specifically addresses the features added by claims 3, 4, 7, and 9. Pet. 43–46. All of the teachings relied on stem from Cohen, and Petitioner’s assertions are supported by the cited evidence. Patent Owner has not asserted, for claims 3, 4, 7, and 9, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1.

Petitioner has proven, by a preponderance of the evidence, that each of claims 3–7 and 9 would have been obvious over Cohen, Cao, and Malis.

c) Claim 8

Claim 8 depends from claim 1 and further recites:

wherein the TDM signal is received from a TDM source in a circuit-switched network, and comprising receiving a non-synchronous input signal comprising input packets from a packet source outside the circuit-switched network, and applying the second encapsulation scheme to encapsulate the input packets in output packets for transmission over the packet-switched network.

Ex. 1001, 19:45–51.

Petitioner specifically addresses the feature added by claim 8. Pet. 45–46. According to Petitioner, Cohen describes receiving non-synchronous input packets from a packet-switched network and encapsulates the input packets for transmission over networks. *Id.* at 45. According to Petitioner, Malis teaches receiving TDM signals having synchronous voice data, and the ’755 patent acknowledges it was generally known that circuit-switched networks provide synchronous data. *Id.* (citing Ex. 1001, 5:59–60; Ex. 1007, 2). Petitioner asserts that SONET lines, such as the one on Cohen, commonly serve as trunks for carrying traffic between circuits in a circuit-switched network. *Id.* (citing Ex. 1003 ¶¶ 184–186). Thus, Petitioner asserts that Cohen and Malis together reasonably would have suggested

receiving TDM signals from a TDM source in a circuit-switched network and receiving non-synchronous input packets from packet sources outside circuit switched networks. *Id.* at 45–46 (citing Ex. 1003 ¶¶ 187–188).

Petitioner’s assertions are supported by the cited evidence. Patent Owner has not asserted, for claim 8, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that claim 8 would have been obvious over Cohen, Cao, and Malis.

d) Claims 10 and 11

Claim 10 depends from claim 1 and further recites: “wherein encapsulating the data comprises adding one or more labels to the data for transmission through a tunnel in the packet-switched network.”

Ex. 1001, 20:1–4. Claim 11 depends from claim 10 and further recites: “wherein the tunnel is defined by Multi-Protocol Label Switching (MPLS) in the packet switched network.” *Id.* at 20:5–7.

Petitioner explains that Cohen teaches that labels are commonly added to frames, e.g., C2-signal label bytes, when encapsulating data. Pet. 46 (citing Ex. 1005, 6:10–12, 13:8–11). Petitioner also notes that the provisional application incorporated by reference into the Cohen disclosure explains that the addition of frames extends to encapsulation for MPLS. *Id.* (citing Ex. 1015, 2). Petitioner further explains: “Malis teaches adding a CES encapsulation header to synchronous TDM signal. Malis describes adding MPLS labels to the encapsulated synchronous TDM signal. And Malis discloses MPLS labels are used in connection with virtual circuit (‘VC’) labels for transmission through tunnels in packet-switched networks.” *Id.* at 46–47 (citing Ex. 1007, 2, 5, 7–9). We are persuaded by

Petitioner that Cohen and Malis together reasonably would have suggested the limitations added by claims 10 and 11, because Malis teaches a CES encapsulation method applicable to TDM SONET input signals such as that received by Cohen.

Petitioner's assertions are supported by the cited evidence. Patent Owner has not asserted, for claims 10 and 11, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that each of claims 10 and 11 would have been obvious over Cohen, Cao, and Malis.

e) Claim 12

Claim 12 depends from claim 11 and further recites: “wherein encapsulating the data comprises encapsulating the data in one or more output packets, and prepending one or more Pseudo Wire (PW) labels to each of the output packets.” Ex. 1001, 20:8–10. Petitioner explains that one with ordinary skill in the art “would have understood VC labels [as disclosed in Malis] are used for pseudo-wire labels,” because “it was generally known that such [VC] labels were used to transport packets through MPLS tunnels.” Pet. 47. Petitioner further explains:

Thus, based on Malis's teachings, a POSITA [person of ordinary skill in the art] would have found it obvious to have Cohen's data encapsulation add a PW label to each output packet for transmission through an MPLS tunnel in the packet-switched network. A POSITA would have been motivated to do so because this would allow for encapsulating synchronous SONET signals for transmission across packet-switched networks, including MPLS. This would further Cohen's desire to transport SONET signals across packet-switched networks.

Id. (citing Ex. 1003 ¶¶ 198–199; Ex. 1005, 2:12–32, 3:9–12, 13:5–10).

Petitioner's assertions are supported by the cited evidence. Patent Owner has not asserted, for claim 12, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that claim 12 would have been obvious over Cohen, Cao, and Malis.

f) Claims 13 and 14

Claim 13 depends from claim 1, and further recites: “wherein encapsulating the data in accordance with the first encapsulation scheme comprises breaking the data into fragments of fixed length and encapsulating the fragments in respective output packets which are transmitted over the network in approximate synchronization with the payload of the TDM input signal.” Ex. 1001, 20:12–17. Claim 14 depends from claim 13 and further recites: “wherein encapsulating the fragments in the respective output packets comprises prepending a Circuit Emulation over Packet (CEP) header to each of the fragments.” *Id.* at 20:18–21.

The “first encapsulation scheme” as referenced in claims 13 and 14 has its antecedent basis in claim 1. Thus, “the first encapsulation scheme” refers to the encapsulation scheme corresponding to determination of synchronous data, not determination of non-synchronous data which leads to selection of a “second encapsulation scheme.” *Id.* at 19:8–12.

Petitioner relies on the encapsulation scheme disclosed in Malis to meet the added limitations of claims 13 and 14. Pet. 48. Specifically, Petitioner explains:

Malis teaches breaking data into fragments of fixed length and encapsulating the fragments in respective output packets by prepending CEP headers to the fragments for transmission over the network in synchronization with the payload of the TDM-input

signal. Thus, for the reasons shown for element 1.3, Malis' teachings toward CES encapsulation render obvious Cohen's receiver supporting a first encapsulation scheme that breaks data into fragments of fixed length and encapsulates the fragments in respective output packets by pre-pending CEP headers to the fragments for transmission over the network in approximate synchronization with the payload of the TDM-input signal.

Id. (citations omitted).

Petitioner's assertions are supported by the cited evidence. Patent Owner has not asserted, for claims 13 and 14 and for the above-quoted assertions of Petitioner, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. PO Resp. 45–46.¹⁹

Petitioner has proven, by a preponderance of the evidence, that each of claims 13 and 14 would have been obvious over Cohen, Cao, and Malis.

g) Claim 15

Claim 15 depends from claim 1 and further recites: “wherein encapsulating the data in accordance with the second encapsulation scheme comprises extracting overhead information from the TDM signal, and generating overhead packets in order to convey the overhead information over the packet-switched network separately from the data.” Ex. 1001, 20:22–27. Petitioner explains:

Cohen discloses SONET frames including overhead information, such as alarms and signal labels, from TDM signals. And Cohen extracts overhead information from the TDM signal, then encapsulates and compresses the payload separate from the

¹⁹ In its Reply, Petitioner presents a new argument with respect to claims 13 and 14, i.e., that Cohen alone discloses the added limitations of claims 13 and 14. Reply 18–20. This theory was not presented in the Petition. Its presentation for the first time in the Reply is belated and we decline to consider it. *See Intelligent BioSys.*, 821 F.3d at 1369–70.

overhead information before conveying that information over the network. The '755 Patent acknowledges it was generally known SONET frames carry overhead information is [sic] separate from the payload and encapsulating information using known management frames (e.g., LDP).

Pet. 48–49 (citing Ex. 1005, 1:29–2:2, 6:19–7:2; Ex. 1003 ¶¶ 203–206). It is inconsequential that this teaching is not specifically directed to just non-synchronous data because, as discussed above in the context of claim 1, the second encapsulation method differs from the first encapsulation method in other ways.

Petitioner's assertions are supported by the cited evidence. Patent Owner has not asserted, for claim 15, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that claim 15 would have been obvious over Cohen, Cao, and Malis.

h) Claim 16

Claim 16 depends from claim 1 and further recites:

wherein encapsulating the data comprises assigning first and second service levels, respectively, to the packets encapsulated in accordance with the first and second encapsulation schemes, such that the packets at the first service level are transmitted over the packet-switched network with a higher priority than the packets at the second service level.

Ex. 1001, 20:28–34. Petitioner presents two rationales for why the references teach claim 16's limitations, the first based on Cohen, and the second based on Cohen and Malis, discussed below, both persuasive, notwithstanding Patent Owner's counter-arguments.

First, Petitioner asserts that it was well known that TDM networks transmit synchronous data as well as non-synchronous data, and that

synchronous data requires transport in real-time at constant data rates, whereas non-synchronous data can accommodate bursts of peak data rates. Pet. 50 (citing Ex. 1001, 2:20–37, 4:29–35, 5:16–23). Petitioner also asserts: “Because of these differing requirements, a POSITA would have understood any compression/decompression applied by Cohen based on the C2-byte would accommodate such requirements and thus constitute a service level.” *Id.* (citing Ex. 1003 ¶ 212). Petitioner explains:

Based on Cohen’s teachings and the general knowledge available in the art, Cohen discloses or renders obvious assigning first and second service levels, respectively, to packets encapsulated in accordance with the first and second encapsulation schemes, such that packets at the first service level are transmitted over the packet-switched network with a higher priority than packets at the second service level.

Id. (citing Ex. 1003 ¶ 213). Based on the above-quoted reasoning, we do not see how Cohen discloses that synchronous data is assigned higher priority, but Petitioner’s reasoning is persuasive that Cohen reasonably would have suggested to one with ordinary skill in the art that synchronous data encapsulation and transmission should have higher priority than non-synchronous data.

Alternatively, Petitioner notes:

Further, Malis teaches it was known that TDM traffic may include “private leased line services.” And Malis describes supporting VT services and lower speed services. A POSITA would have understood such leased services and lower speed services are often used to provide a PSN having a higher priority service level relative to other service levels.

Based on Malis’[s] teachings and the knowledge generally available, a POSITA would have found it obvious to assign packets encapsulated using the first encapsulation scheme with a first service level having a higher priority to packets encapsulated using the second encapsulation scheme. A

POSITA would have been motivated to do so because this would allow for transmitting synchronous voice data, which needs real-time transmission, at a higher priority level than non-synchronous, e.g., Ethernet or IP frames, packet data.

Id. at 50–51 (citing Ex. 1007, 2–3; Ex. 1003 ¶¶ 214–215) (footnote citations omitted). Petitioner’s reasoning is supported by the cited evidence.

Patent Owner argues that “[n]either Cohen nor Malis includes any discussion of the assignment of service levels” and Petitioner’s accounting is based on “unsupported inferential leaps” such as “synchronous data requires transport in real-time at constant data rates whereas non-synchronous data can accommodate bursts of peak data rates.” PO Resp. 46–47. Patent Owner asserts that merely accommodating synchronous and non-synchronous data is not tantamount to assigning first and second service levels in accordance with the corresponding first and second encapsulation schemes. *Id.* at 47. Patent Owner also asserts that Malis’s disclosure about “private leased line services” and support for varying speeds of services does not teach or suggest assignment of first and second service levels. *Id.* For these assertions, Patent Owner cites only paragraph 95 of Dr. Akl’s Declaration, reproduced below:

95. A [person of ordinary skill in the art] would not have understood Cohen or Malis to disclose service levels for synchronous and non-synchronous data as a result of the differing data rate requirements of the two data types and Cohen and/or Malis’s ability to accommodate those data rates.

Ex. 2004 ¶ 95. This testimony is conclusory and provides no underlying reasoning or explanation. As such, it is entitled to little weight. *See* 37 C.F.R. § 42.65(a); *Xerox Corp. v. Bytemark, Inc.*, IPR2022-00624, Paper 12 at 5 (PTAB Feb. 10, 2023) (Vidal, Director) (Precedential).

In contrast, the testimony of Dr. Lavian supporting Petitioner's assertions is specific and well-reasoned, and thus not conclusory. Ex. 1003

¶¶ 212–215. For instance, Dr. Lavian testifies:

212. And as discussed above with respect to claim element 1.2, the '755 Patent confirms it was well known in the art that TDM networks transmit synchronous data (e.g., voice data) as well as non-synchronous data (e.g. IP data), and that synchronous data requires transport in real-time at constant data rates whereas non-synchronous data can accommodate bursts of peak data rates. Because of these different requirements, [one of ordinary skill in the art] would have understood any compression/decompression applied by Cohen based on the C2 byte would accommodate such differing requirements and thus constitute a service level. For example, for synchronous data, the priority would be to transport the data as quickly as possible and maintain the constant flow, even if the data wasn't compressed to the maximum extent possible. The synchronous data's service level (e.g., SL-A) would thus be prioritized to complete first and tasked with rapid compression/decompression. But for non-synchronous data the importance may be to compress/decompress the bursts of high volume as much as possible, even if it took more time to do so. The non-synchronous data's service level (e.g., SL-B) would be configured to compress the data more than possible in SL-A. This results in the TDM network having two service levels—SL-A for synchronous data and SL-B for non-synchronous data—and the network would need to identify which service level to use for each packet 213.

213. Based on Cohen's teachings and the general knowledge available in the art, Cohen discloses or suggests that encapsulating the data comprises assigning first and second service levels, respectively, to the packets encapsulated in accordance with the first and second encapsulation schemes, such that the packets at the first service level are transmitted over the packet-switched network with a higher priority than the packets at the second service level.

Id. ¶¶ 212–213. With this explanation by Dr. Lavian, we disagree with Patent Owner that Petitioner's assertions that Cohen reasonably would have

suggested to one with ordinary skill in the art two levels of assigned service are “unsupported inferential leaps.” The same is true with respect to Dr. Lavian’s testimony regarding a suggestion by Malis. *Id.* ¶¶ 214–215.

With regard to claim 16, we credit the testimony of Dr. Lavian over the testimony of Dr. Akl. Petitioner has proven, by a preponderance of the evidence, that claim 16 would have been obvious over Cohen, Cao, and Malis.

i) Claims 17 and 18

Claim 17 depends from claim 1 and further recites: “wherein encapsulating the data in accordance with the second encapsulation scheme comprises detecting idle data in the payload carried by the TDM input signal, and generating output packets to encapsulate the data while omitting from the output packets at least some of the idle data.” Ex. 1001, 20:35–40. Claim 18 depends from claim 17 and further recites: “wherein detecting the idle data comprises detecting one or more idle bytes between input packets carried by the TDM input signal.” *Id.* at 20:41–43.

Petitioner explains:

Regarding claims 17–18, the ’755 Patent recognizes it was known that HDLC signals include idle bytes to separate frames. Similarly, Cohen generates output packets omitting some idle data via compression. And Cohen removes all but one occurrence of multiple, sequential idle bytes of an HDLC signal. This removal technique parallels the ’755 Patent’s approach of omitting at least some of the idle data from output packets. Thus, Cohen detects idle data in the payload and generates output packets omitting some idle data. And a POSITA would have understood these idle bytes in the inter-frame-gap constitute idle bytes between input packets carried by HDLC signals.

Pet. 52 (citing Ex. 1001, 12:67–13:2, 13:44–46, 14:4–6; Ex. 1005, 13:24–28, 14:16–20; Ex. 1003 ¶¶ 221–224, 227–228). Dr. Lavian testifies that a

person of ordinary skill in the art would have understood that “frames comprise non-synchronous data when the receiver identifies PPP frames, HDLC frames, or asynchronous DS-3 data.” Ex. 1003 ¶ 119. We have determined above, in discussing claim 1 and in the context of the specification of the ’755 patent, that PPP, HDLC, and asynchronous DS-3 data types indicate nonsynchronous data. According to claim 1, the second encapsulation scheme is for nonsynchronous data.

Petitioner’s assertions are supported by the cited evidence. Patent Owner has not asserted, for claims 17 and 18, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that each of claims 17 and 18 would have been obvious over Cohen, Cao, and Malis.

j) Claim 19

Claim 19 depends from claim 17 and further recites: “wherein detecting the idle data comprises detecting one or more idle cells between input cells carried by the TDM input signal.” Ex. 1001, 20:44–46.

Petitioner explains:

Regarding claim 19, Cohen teaches SONET synchronous transport signals can carry ATM cells. And the ’952 Provisional, which Cohen incorporates-by-reference, teaches “ATM cell as 53 bytes long . . . Data in non-used (idle) cells is usually constant, and therefore there is a good potential for compression. . . . A possible compression method would be to identify the ATM cell boundaries, unscramble the data and compress.

Further, Malis teaches using dynamic bandwidth allocation, such as in Cohen, based on patterns in SONET SPE frames, including those in “ATM idle cells.” Thus, for the reasons shown for element 1.3, Cohen and Malis render obvious having first and second encapsulation schemes with the second

encapsulation scheme detecting one or more idle cells between input cells carried by the TDM input signal.

Pet. 52–53 (citing Ex. 1005, 2:8–10; Ex. 1007, 8; Ex. 1015, 11–12; Ex. 1003 ¶¶ 229–233) (alteration by Petitioner).

Petitioner’s assertions are supported by the cited evidence. Patent Owner has not asserted, for claim 19, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a preponderance of the evidence, that claim 19 would have been obvious over Cohen, Cao, and Malis.

k) Claim 20

Claim 20 depends from claim 17 and further recites: “wherein generating the output packets comprises joining together at least first and second information-carrying sequences of the data from the TDM input signal so as to generate one of the output packets while eliminating all of the idle data intervening between the first and second information-carrying sequences.” Ex. 1001, 20:47–52. Petitioner explains:

As shown for claims 17–18, Cohen detects idle bytes between input packets of HDLC signals and removes all but one occurrence of multiple, sequential idle bytes. In doing so, Cohen describes joining together information-carrying data sequences to generate an output packet while eliminating intervening idle data. Thus, Cohen discloses the additional elements of claim 20.

Pet. 53 (citing Ex. 1005, 14:16–20; Ex. 1003 ¶¶ 234–236).

Petitioner’s assertion is supported by the cited evidence. Patent Owner has not asserted, for claim 20, arguments separate from and additional to those it has asserted for claim 1, all of which we have addressed above in the context of claim 1. Petitioner has proven, by a

preponderance of the evidence, that claim 20 would have been obvious over Cohen, Cao, and Malis.

III. CONCLUSION

The outcome for challenged claims 1–20 of the '755 patent is set forth in the Table below:²⁰

Claims	35 U.S.C. §	Reference(s)/Basis	Claims Shown Unpatentable	Claims Not shown Unpatentable
1–20	103	Cohen, Cao, Malis	1–20	
1–20	103	Choi, Lewin, Zelig		1–20
Overall Outcome			1–20	

²⁰ Should Patent Owner wish to pursue amendment of the challenged claims in a reissue or reexamination proceeding subsequent to the issuance of this decision, we draw Patent Owner's attention to the April 2019 Notice Regarding Options for Amendments by Patent Owner Through Reissue or Reexamination During a Pending AIA Trial Proceeding. *See* 84 Fed. Reg. 16,654 (Apr. 22, 2019). If Patent Owner chooses to file a reissue application or a request for reexamination of the challenged patent, we remind Patent Owner of its continuing obligation to notify the Board of any such related matters in updated mandatory notices. *See* 37 C.F.R. § 42.8(a)(3), (b)(2).

IV. ORDER

In consideration of the foregoing, it is hereby:

ORDERED that Petitioner has proven by a preponderance of the evidence that claims 1–20 of the '755 patent are unpatentable; and

FURTHER ORDERED that, because this is a Final Written Decision, parties to the proceeding seeking judicial review of the decision must comply with the notice and service requirements of 37 C.F.R. § 90.2.

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