IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

COUTURE LICENSING LLC,
 	
     Plaintiff,
 	
   v.
 	
VERIZON COMMUNICATIONS, INC.,
CELLCO PARTNERSHIP D/B/A VERIZON
WIRELESS, VERIZON BUSINESS
NETWORK SERVICES LLC, and VERIZON
SERVICES CORP.,
 	
     Defendants.
	Civil Action No. 6:21-cv-00774
	
	Jury Trial Demanded

COMPLAINT FOR PATENT INFRINGEMENT

Plaintiff Couture Licensing LLC ("Couture") files this Complaint against Verizon

Communications, Inc., Cellco Partnership d/b/a Verizon Wireless, Verizon Business

Network Services LLC, and Verizon Services Corp. (collectively and individually

referred to herein as "Verizon" or "Defendant") for patent infringement of United

States Patent Nos. 9,525,506 and 9,819,437 (the "patents-in-suit") and alleges as follows:

NATURE OF THE ACTION

1. This is an action for patent infringement arising under the patent laws of

the United States, 35 U.S.C. §§ 1 *et seq.*

THE PARTIES

2.   Couture is a limited liability company organized under laws of the State

of Texas with its principal place of business at 3333 Preston Road, Suite 300, #1019,

Frisco, Texas 75034.

3.   Defendant Verizon Communications, Inc. ("Verizon Communications") is

a Delaware corporation with a principal place of business at 1095 Avenue of the

Americas, New York, New York 10036. Verizon Communications may be served

through its registered agent, CT Corporation System, 350 North St. Paul Street, Dallas,

Texas 75201.

4.   On information and belief, since on or about December 15, 1999, Verizon

Communications has been registered to do business in the state of Texas under Texas

SOS file number 0012992106. On information and belief, Verizon Communications has

directly or indirectly conducted business and continues to conduct business directly or

indirectly in the State of Texas and within the Western District of Texas.

5.   Defendant Cellco Partnership d/b/a Verizon Wireless ("Verizon

Wireless") is a Delaware general partnership with its principal place of business at One

Verizon Way, Basking Ridge, New Jersey 07920. Verizon Wireless is wholly owned by

its corporate parent, Verizon Communications. Cellco Partnership Verizon Wireless

may be served through its registered agent, The Corporation Trust Company,

Corporation Trust Center, 1209 Orange Street, Wilmington, Delaware 19801.

6.   On information and belief, Verizon Wireless maintains Texas Taxpayer

Number 12233728893 in relation to its business activities in the State of Texas and

within the Western District of Texas. On information and belief, Verizon Wireless has directly or indirectly conducted business and continues to conduct business in the State of Texas and within the Western District of Texas.

7. Defendant Verizon Business Network Services LLC ("Verizon Business") is a Delaware limited liability company with a principal place of business at One Verizon Way, Basking Ridge, New Jersey 07920. Verizon Business may be served through its registered agent for service of process in Texas at CT Corporation System, 1999 Bryan St., Suite 900, Dallas, Texas 75201. On information and belief, Verizon Business Network Services, LLC. is a wholly owned subsidiary of Verizon Communications.

8. On information and belief, since on or about March 12, 1973, Verizon Business has been registered to do business in the state of Texas under Texas SOS file number 11327458920. On information and belief, Verizon Business has directly or indirectly conducted business and continues to conduct business in the State of Texas and within the Western District of Texas.

9. Defendant Verizon Services Corp. ("Verizon Services") is a Delaware corporation with a principal place of business at 22001 Loudoun County Parkway Ashburn, Virginia 20147. Verizon Services may be served through its registered agent, CT Corporation System, 1999 Bryan Street, Suite 900, Dallas, Texas 75201. On information and belief, Verizon Services Corp. is a wholly owned subsidiary of Verizon Communications.

10.   On information and belief, since on or about November 16, 2001, Verizon

Services has been registered to do business in the state of Texas under Texas SOS file

number 15213127739. On information and belief, Verizon Services has conducted

business and continues to conduct business in the State of Texas and within the Western

District of Texas.

11.   Verizon Communications, Cellco Partnership, Verizon Business, and

Verizon Services (individually and collectively, "Verizon" or "Defendant") operate

and/or employ, either directly or indirectly, optical communications networks in the

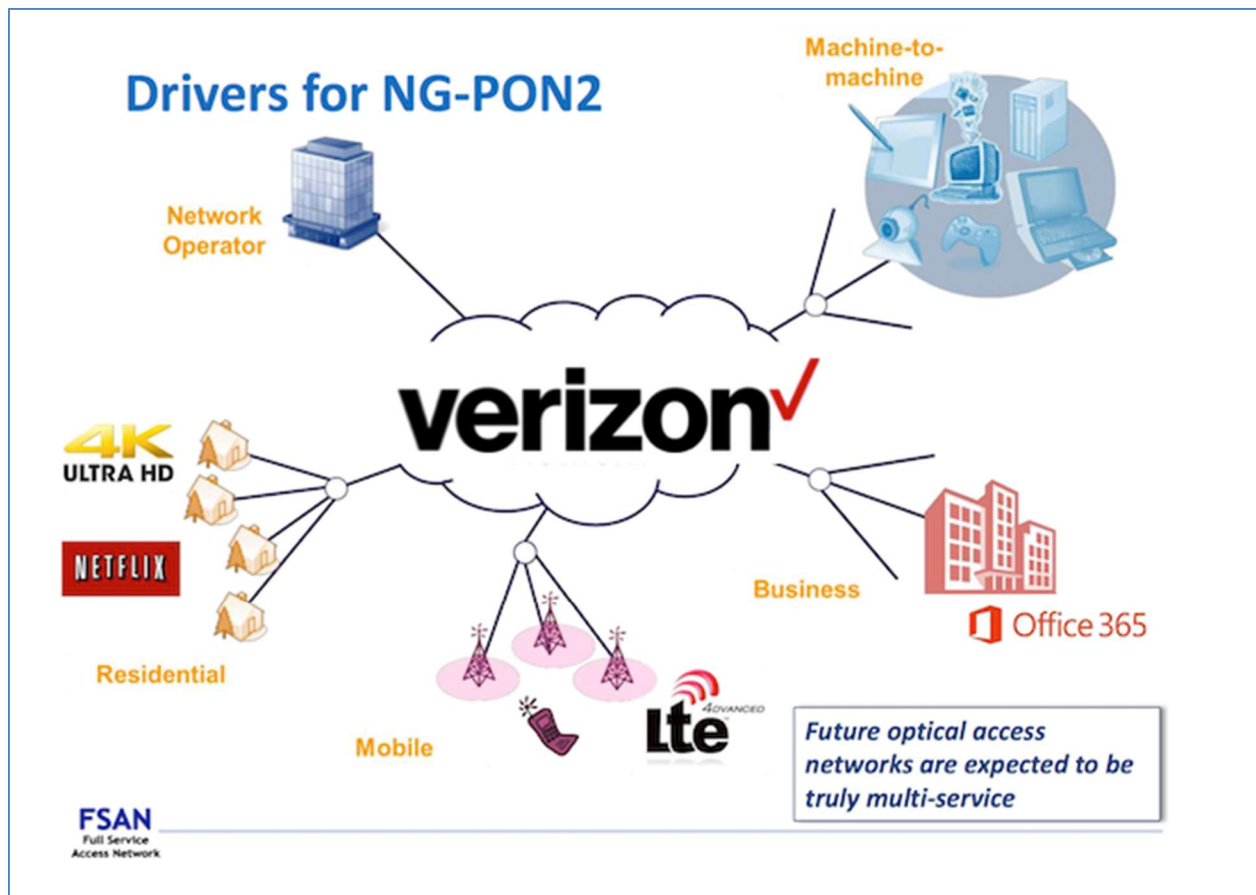United States and in the Western District of Texas.

12.   On information and belief, Verizon operates and/or employs, or has

operated or employed, either directly or indirectly, optical communications networks

that utilize NG-PON2 technology in said networks. (Hereinafter "The Verizon NG-

PON2 Networks").

13.   On information and belief, The Verizon NG-PON2 Networks utilize NG-

PON2 technology in a manner designed to facilitate the transmission and reception of

network traffic during the normal operation of such networks. More specifically,

Verizon NG-PON2 Networks utilize NG-PON2 compliant hardware and software

components, including but not limited to optical line terminals ("OLTs") and Optical

Network Units ("ONUs"), that infringe one or more claims of the each of the patents-in-

suit. Verizon's operation of The Verizon NG-PON2 Networks constitutes a use of such

infringing hardware and/or software and a practice of methods covered by the patents-

in-suit, and therefore constitutes an infringement of one or more claims of the each of the patents-in-suit.

14.   On information and belief, Verizon operates and/or employs, or has operated or employed, either directly or indirectly, The Verizon NG-PON2 Networks in relation to Verizon's making, use, sales, and offers for sale, and Verizon's customer's use of, Verizon's product and service offerings, including but not limited to (1) Verizon products and services that enable the streaming of video content from, to, and/or across Verizon NG-PON2 Networks; (2) Verizon products and services that enable the carrying of network traffic related to subscription-based streaming services from, to, and/or across Verizon NG-PON2 Networks; (3) Verizon products and services that enable the transmission of Verizon's network-operations-related network traffic from, to, and/or across Verizon NG-PON2 Networks; (4) Verizon products and services that enable the transmission network traffic related to IOT products and services from, to, and/or across Verizon NG-PON2 Networks; (5) Verizon products and services that enable the transmission of business-related network traffic from, to, and/or across Verizon NG-PON2 Networks; (6) Verizon products and services that enable the transmission of residential-related network traffic from, to, and/or across Verizon NG-PON2 Networks; (7) Verizon products and services that enable the transmission of mobile-related network traffic from, to, and/or across Verizon NG-PON2 Networks; (8) Verizon products and services that enable the transmission of LTE-related network traffic from, to, and/or across Verizon NG-PON2 Networks; (9) Verizon products and services that enable the transmission of 5G-related network traffic from, to, and/or

across Verizon NG-PON2 Networks; (10) mobile phones and other mobile computing

devices sold directly or indirectly by Verizon that are used to transmit voice or data

traffic from, to, and/or across Verizon NG-PON2 Networks; (11) voice and/or data

network access plans and related services that are used to transmit voice or data traffic

from, to, and/or across Verizon NG-PON2 Networks; (12)Verizon products and

services that enable the transmission of multi-service network traffic from, to, and/or

across Verizon NG-PON2 Networks; (13) current or legacy Verizon products or

services, which use, or have used, one or more of the foregoing products and services as

a component product or component service; (14) combinations of products and/or

services comprising two or more of the foregoing products and services; and (15) all

other current or legacy products and services imported, made, used, sold, or offered for

sale by Verizon that operate, or have operated in a substantially similar manner as the

above-listed products and services, (collectively and individually referred to herein as

the "Verizon NG-PON2 Products and Services").

See https://www.itwire.com/telecoms-and-nbn/verizon-lab-testing-ng-pon2-10-
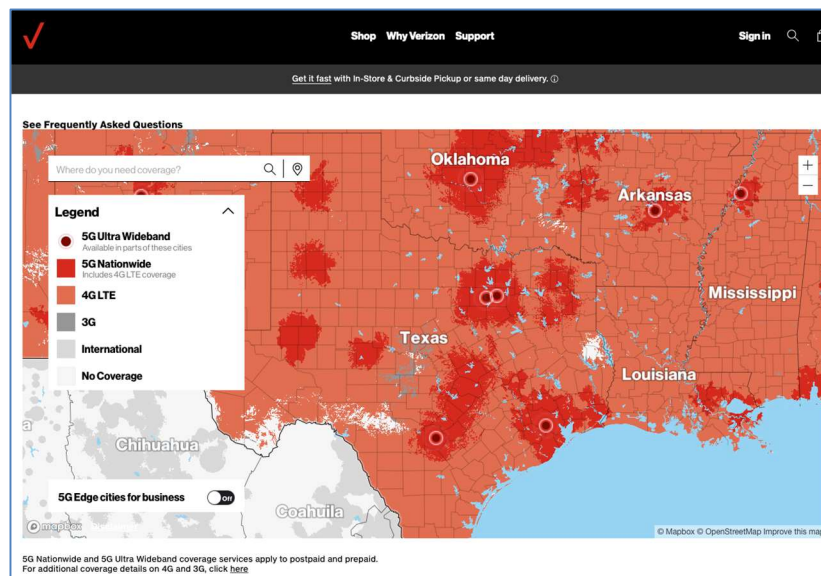
gigabit-tech-in-us-for-4k,-vr,-cloud-and-more.html.

JURISDICTION AND VENUE

15.   This Court has subject matter jurisdiction over this action pursuant to 28

U.S.C. §§ 1331 and 1338(a) because this action arises under the patent laws of the United

States, 35 U.S.C. §§ 1 *et seq.*

16.   Verizon is subject to this Court's personal jurisdiction, in accordance with

due process and/or the Texas Long Arm Statute because, in part, Verizon"[r]ecruits

Texas residents, directly or through an intermediary located in this State, for

employment inside or outside this State." See Tex. Civ. Prac. & Rem. Code § 17.042.

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17.   On information and belief, Verizon operates and/or employs, or has operated and/or employed, either directly or indirectly, Verizon NG-PON2 Networks within the Western District of Texas.

18.   On information and belief, Verizon operates and/or employs, or has operated and/or employed, either directly or indirectly, the Verizon NG-PON2 Networks in all markets where it operates and/or employs, or has operated or employed, either directly or indirectly 5G mobile services, including markets contained in whole or in part within the Western District.[1]

See https://www.verizon.com/coverage-map/.

_____

[1] *See* https://www.lightwaveonline.com/fttx/pon-systems/article/14034625/verizon-full-speed-ahead-with-ngpon2-for-5g-mobile-support*;*

19.   On information and belief, Verizon has made, used, sold, and offered to sell the Verizon NG-PON2 Products and Services within the United States, including within the Western District of Texas.
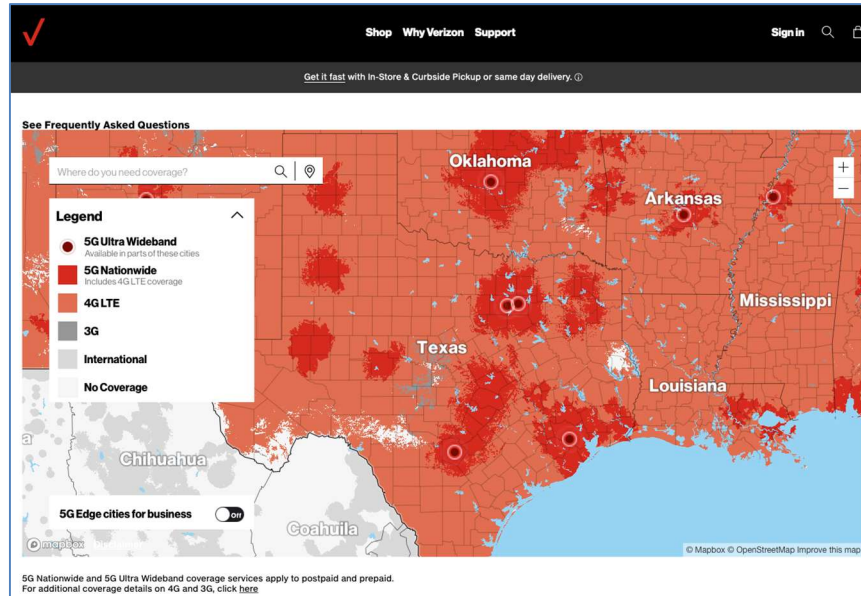
20.   On information and belief, Verizon has made, used, sold access to, and offered to sell access to the Verizon NG-PON2 Networks within the United States, including within the Western District of Texas.

21.   On information and belief, Verizon's customers located in the Western District of Texas have transmitted and/or received network communications to, from, or across Verizon NG-PON2 Networks.

22.   On information and belief, Verizon's customers have purchased and/or used one or more of the Verizon NG-PON2 Products and Services within the Western District of Texas.

23.   The Court has personal jurisdiction over Verizon at least because it has continuous business contacts in the State of Texas and in this District. Verizon has engaged in business activities including transacting business in the Western District of Texas and purposefully directing its business activities, including the provision of infringing communications networks and services, and the use, marketing, sale or offer for sale of mobile devices and network services, comprising The Verizon NG-PON2 Networks and Verizon NG-PON2 Products and Services in this District, and the sale or offer for sale of services and goods to this District to aid, abet, or contribute to the infringement of third parties in this District. For example, on information and belief, Verizon — either directly or through those acting on its behalf — offers access to The

Verizon NG-PON2 Networks and the Verizon NG-PON2 Products and Services in this
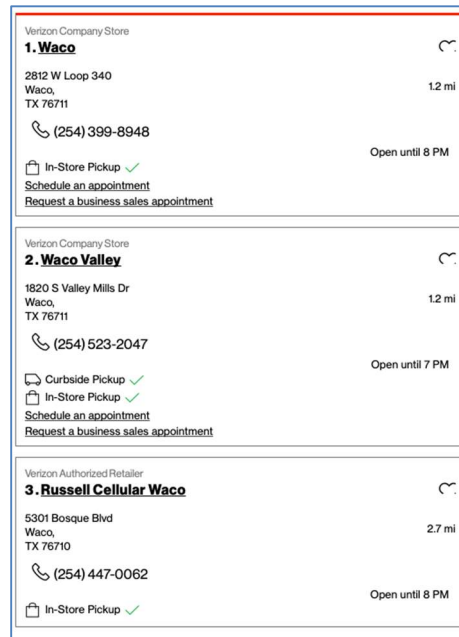
District, as shown below:

See https://www.verizon.com/coverage-map/.

See e.g. https://www.verizon.com/stores/storesearchresults/?lat=31.5140575&long=-

97.15209259999999&q=76711.

24.   Verizon - either directly or through those acting on its behalf - has stores and/or authorized retailers in this District in which infringing communications networks, products, and services are offered for sale.

See e.g. https://www.verizon.com/stores/storesearchresults/?lat=31.5140575&long=-97.15209259999999&q=76711.

25.   Verizon has already admitted that this Court has personal jurisdiction over Verizon Wireless and Verizon Business in a recent patent litigation bearing docket No. 6:20-CV-00090-ADA.

26.   Personal jurisdiction over Verizon is also appropriate because Verizon has availed itself of this Court by filing counterclaims in a recent patent litigation bearing docket No. 6:20-CV-00090-ADA.

27.   This Court has personal jurisdiction over Verizon because it committed and continues to commit acts of infringement in this judicial district in violation of 35

U.S.C. §§ 271(a). In particular, on information and belief, Verizon has made, used, offered to sell and/or sold Verizon NG-PON2 Products and Services, and made, used, offered to sell access to and/or sold access to The Verizon NG-PON2 Networks in the Western District of Texas.

28.   On information and belief, Verizon is subject to the Court's jurisdiction because it regularly conducts and solicits business, or otherwise engages in other persistent courses of conduct in this judicial district, and/or derives substantial revenue from the sale and distribution of goods and services, including but not limited to The Verizon NG-PON2 Networks and Verizon NG-PON2 Products and Services provided to individuals and businesses in the Western District of Texas.

29.   This Court has personal jurisdiction over Verizon because, inter alia, Verizon, on information and belief: (1) has committed acts of patent infringement in this Western District of Texas; (2) maintains a regular and established place of business in the Western District of Texas; (3) has substantial, continuous, and systematic contacts with this State and the Western District of Texas; (4) owns, manages, and operates facilities in this State and the Western District of Texas; (5) enjoys substantial income from its operations and sales in this State and the Western District of Texas; (6) employs Texas residents in this State and the Western District of Texas, and (7) solicits business and markets communications networks, communications products, communication systems and/or communication services in this State and the Western District of Texas including, without limitation, The Verizon NG-PON2 Networks and Verizon NG-PON2 Products and Services.
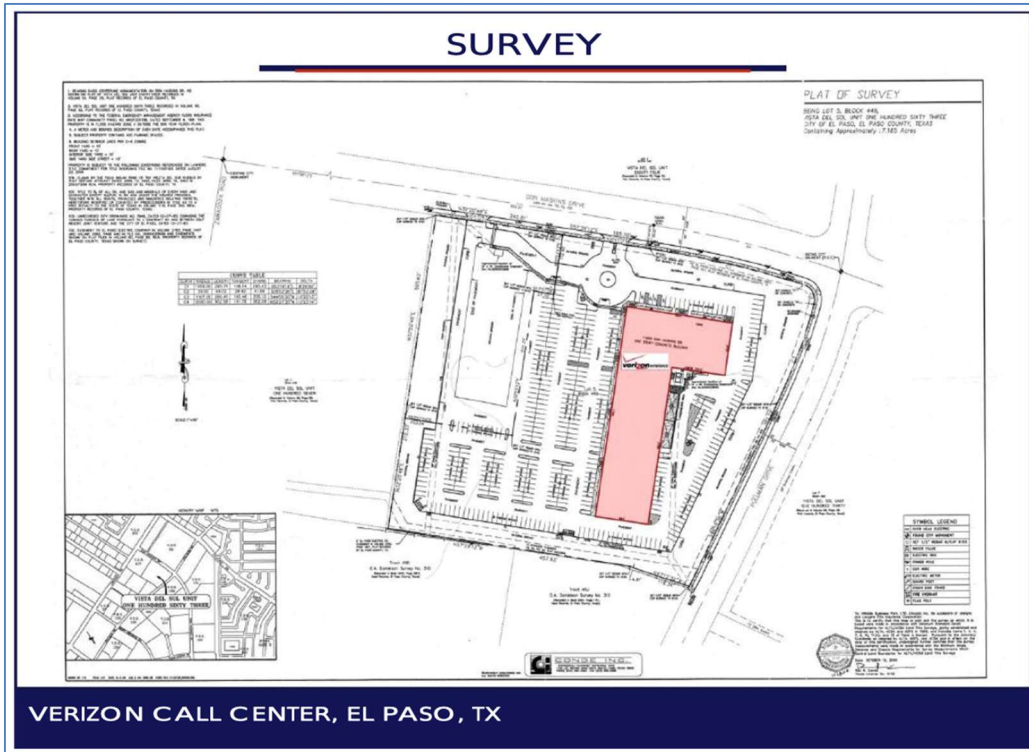
12

30.   Venue is proper pursuant to 28 U.S.C. §§ 1391(b), (c), (d) and/or 1400(b), at least because Verizon, has committed acts of infringement in this judicial district, and has a regular and established place of business in this judicial district.

31.   In fact, this judicial district was deemed to be a proper venue for patent cases against Verizon in an action bearing C.A. No. 6:20-CV-00090-ADA.

32.   Verizon has admitted in an action bearing C.A. No. 6:20-CV-00090-ADA that "it conducts and has conducted business in the State of Texas and in the Western District of Texas including through stores and/or authorized retailers and other locations."

33.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established place of business in this judicial district located at 1459 Don Haskins Dr., El Paso, Texas.

VERIZON CALL CENTER, EL PASO, TX

See https://www.readkong.com/page/verizon-call-center-investment-opportunity-5473867.

34.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established places of business in this judicial district located at 1820 S. Valley Mills Drive., Waco, Texas, 76711; 5301 Bosque Blvd., Ste. 120, Waco, Texas 76710; and 2812 W. Loop 340, Suite #H-112, Waco, Texas 76711.

See https://www.verizon.com/stores/storesearchresults/?lat=31.5140575&long=-97.15209259999999&q=76711.
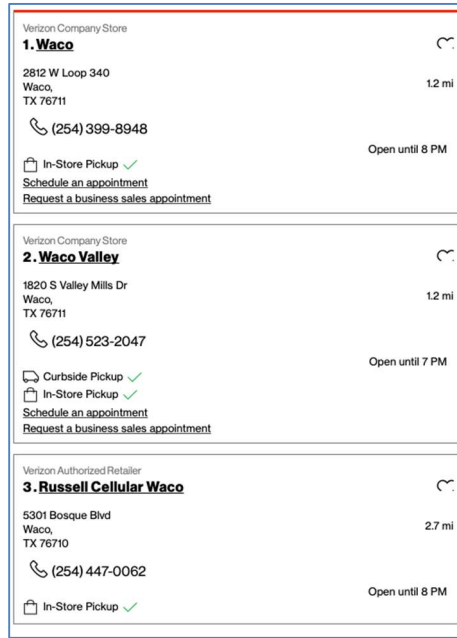
35.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established place of business in this judicial district located at 222 Rotary, San Antonio, TX, 78202:

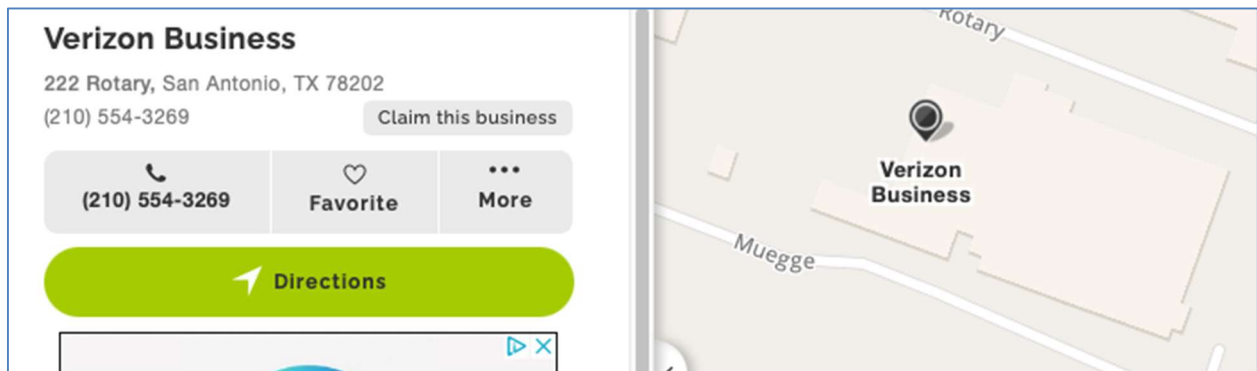*See* https://www.mapquest.com/us/texas/verizon-business-357464356.

36.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established place of business in this judicial district located at 951 Burnet Rd., Austin, Texas 78757:

37.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established place of business in this judicial district located at 3718 N Lamar Blvd., Austin TX 78705:

38.   On information and belief, Verizon has previously maintained and continues to maintain a regular and established place of business in this judicial district located at 3590 Greenlawn Blvd. 103 Round Rock, TX 78664:
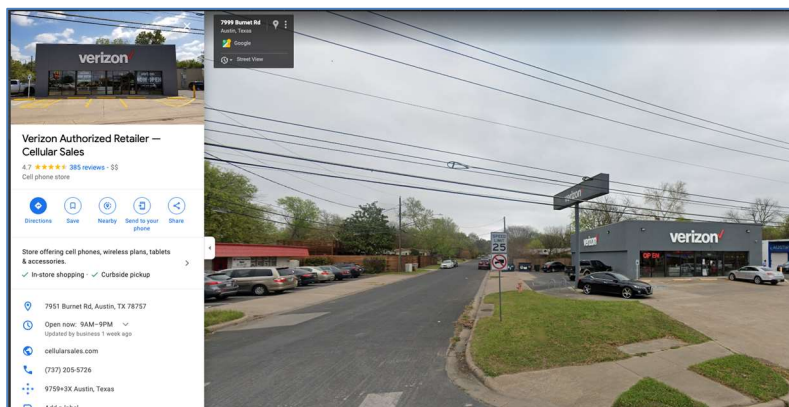
39.   On information and belief, Verizon has previously maintained and

continues to maintain a regular and established place of business in this judicial district

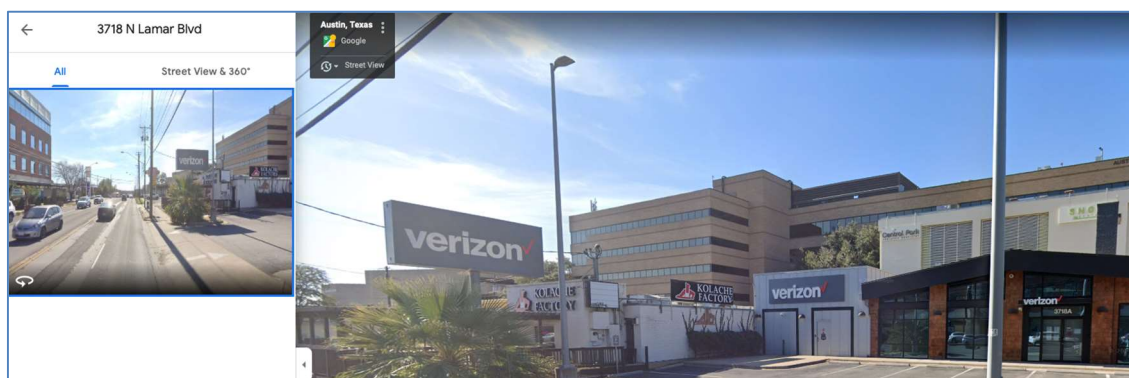located at 10801 N MO-PAC Expressway 3-500, Austin, TX 78759:

40.   On information and belief, Verizon has previously maintained and

continues to maintain a regular and established place of business in this judicial district

located at 3815 S Capital of TX Highway, 200, Austin, TX 78704. *See*

http://propaccess.traviscad.org.

41.   On information and belief, Verizon has previously maintained and

continues to maintain a regular and established place of business in this judicial district

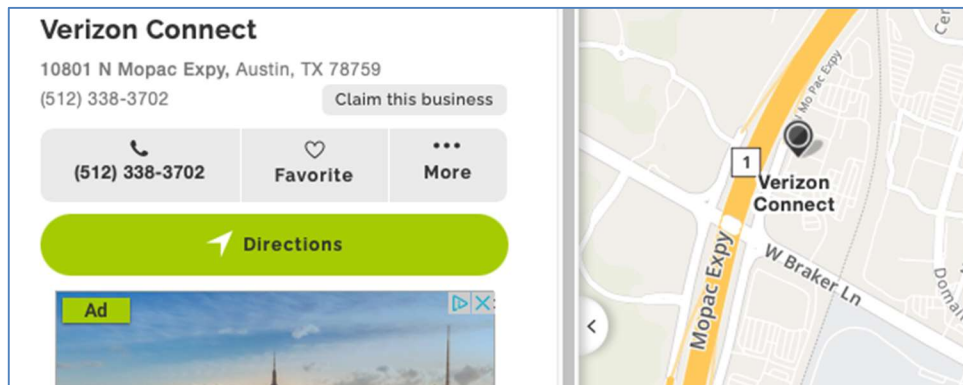located at 2525 Ridgepoint Dr., Austin, TX 78754:

42.   On information and belief, Verizon has previously maintained and

continues to maintain a regular and established places of business in this judicial district

beyond those specifically named herein.

United States Patent No. 9,525,506

43.   On December 20, 2016, the United States Patent and Trademark Office

("USPTO") duly and legally issued United States Patent No. 9,525,506 ("the '506

patent") entitled "Rogue Optical Network Unit Mitigation in Passive Optical

Networks" to inventors Bo Gao, Yuanqiu Luo, Frank Effenberger, and Jianhe Gao.

44.   The '506 patent is presumed valid under 35 U.S.C. § 282.

45.   Couture owns all rights, title, and interest in the '506 patent.

46.   Couture has not granted Verizon an approval, an authorization, or a

license to the rights under the '506 patent.

47.   The '506 patent relates to, among other things, an improvement to the

operation of the hardware, software, and operation of passive optical networks.

48.   The claimed invention(s) of the '506 patent sought to solve problems with,

and improve upon, existing passive optical network systems. For example, the '506

patent states:

> Prior PON technologies are single-wavelength PONs and employ an OLT with a single OLT channel CT, which is an OLT port communicating with ONUs. Therefore, the prior PON technologies do not support ONU wavelength tuning. NG-PONs and NG-PON2s, including multiple-wavelength PONs such as WDM PONs, P2P-WDM PONs, and TWDM PONs may have multiple OLT CTs in order to support the multiple wavelengths. Each OLT CT may provide data transmission in a pair of upstream and downstream wavelengths. Upstream may refer to the direction of communication from an ONU to the OLT. Downstream, on the other hand, may refer to the direction of communication from the OLT to the ONU. An OLT CT may instruct its corresponding ONUs to tune their upstream wavelengths during operation. The ONU wavelength tunability may help to balance the traffic load in the upstream wavelength channels. The tunability may also help conserve OLT power consumption by tuning ONUs to a limited number of wavelengths and turning off some OLT CTs.
>
> A rogue wavelength tuning may occur when an ONU tunes to a wrong upstream wavelength, in other words, a wavelength different from the destination upstream wavelength demanded by a target OLT CT, which may result in congestion of the upstream transmission. Existing standard draft, International Telecommunication Union Telecommunication Standardization Sector (ITU-T) G.989.3, assumes all the OLT CTs are well coordinated, which is not always true. Additionally, according to ITU-T G989.3 the ONU wavelength tuning does not require confirmation from the target OLT CT, which makes it difficult to realize the rogue wavelength tuning when it occurs. Rogue wavelength tuning in optical transport network (OTN) may be mitigated utilizing various wavelength-selective components in the optical path to filter out optical signals with the correct upstream wavelength and block optical signals with the wrong upstream wavelengths. However, no such wavelength-selective components are allowed in PONs. Therefore, no rogue wavelength tuning mitigation options are available in PONs technology.

See '506 Specification at col. 3, ll. 21–59.

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49.   The '506 patent then states:

Disclosed herein are embodiments for tuning an upstream wavelength of an ONU. The disclosed embodiments may mitigate the rogue wavelength tuning of the ONU, which may prevent network congestion when the ONU tunes to a wrong upstream wavelength. The source OLT CT transmits a broadcast notification message to all other OLT CTs within the OLT after receipt of a tuning acknowledgement message from the ONU. The target OLT CT transmits a broadcast notification message to all other OLT CTs in the OLT after transmitting the tuning confirmation message, where the broadcast notification message indicates that the upstream wavelength tuning of the ONU is complete. The disclosed embodiments apply inter channel termination protocol (ICTP) to coordinate all OLT CTs during upstream wavelength tuning of the ONU.

See '506 Specification at col. 3, l. 60 – col. 4, l. 7.

50.   The invention(s) claimed in the '506 patent solves various technological problems inherent in the then-existing passive optical networking systems and enables such systems to, among other things: (1) function more efficiently; (2) lower the required level of expertise required to support and troubleshoot such systems; (3) reduce or eliminate costs and technical challenges associated with rogue wavelength tuning in optical network units operating in such systems; and (4) permit the cost-effective and efficient use of TWDM technology in passive optical networks.

United States Patent No. 9,819,437

51.   On November 14, 2017, the USPTO duly and legally issued United States Patent No. 9,819,437 ("the '437 patent") entitled "Rogue Optical Network Unit Mitigation in Passive Optical Networks" to inventors Bo Gao, Yuanqiu Luo, Frank Effenberger, and Jianhe Gao.

52.   The '437 patent is presumed valid under 35 U.S.C. § 282.

53.   Couture owns all rights, title, and interest in the '437 patent.

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54.   Couture has not granted Verizon an approval, an authorization or a license to the rights under the '437 patent.

55.   The '437 patent relates to, among other things, an improvement to the operation of the hardware, software, and operation of passive optical networks.

56.   The specification of the '437 patent is the same as the '506 patent specification, and solves the problems recited above and described in the '506 patent specification.

CLAIMS FOR RELIEF

Count I – Infringement of United States Patent No. 9,525,506

57.   Couture repeats, realleges, and incorporates by reference, as if fully set forth here, the allegations of the preceding paragraphs above.

58.   On information and belief, Verizon (or those acting on its behalf) makes, uses, sells access to, and/or offers to sell access to the Verizon NG-PON2 Networks and makes, uses, sells, and/or offers for sale the Verizon NG-PON2 Products and Services in the United States. Verizon, as well as the Verizon NG-PON2 Networks and Verizon NG-PON2 Products and Services, infringe (literally and/or under the doctrine of equivalents) at least claims 1 and 14 of the '506 patent.

59.   On information and belief, on or about June 30, 2017, Verizon released, published, and/or otherwise disseminated the "Verizon OpenOMCI Specification,

version 1.00."[2] The Verizon OpenOMCI Specification provides that "the Verizon

OpenOMCI specification: … makes necessary extensions to support NG-PON2 multi-

wavelength channel architecture and the new features introduced by the NG-PON2

PMD and TC layer specifications, G.989.2 and G.989.3."[3] The Verizon OpenOMCI

Specification further provides that "[g]overned by the objective of achieving

interoperability while meeting the Verizon NG-PON2 system requirements, Verizon

OpenOMCI extends the existing G.988 MEs with the new MEs that: … support the

G.989.3-specified OMCI-based functions (CPI management, wavelength management

and protection, enhanced performance monitoring) …. For the NGPON2 equipment

deployed in the Verizon network, the compliance with Verizon OpenOMCI

specification is required."[4]

60.   On information and belief, the Verizon NG-PON2 Networks and the

hardware and software that enable the Verizon NG-PON2 Networks to function as

intended conform to the requirements of the Verizon OpenOMCI specification

standard.

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[2] *See*
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjfoITg
xPfxAhWqFVkFHYaSB1IQFjAAegQIBRAD&url=https%3A%2F%2Fwww.verizon.com%2Fa
bout%2Fsites%2Fdefault%2Ffiles%2FVerizon-OpenOMCI-
Specification.docx&usg=AOvVaw2tutGWSkVKwd1TIV3U7uZ0

[3] *Id*. at p. 3.

[4] *Id*. at p. 10.

61.   On information and belief, the Verizon NG-PON2 Networks and the

hardware and software that enable the Verizon NG-PON2 Networks to function as

intended conform to the requirements of the ITU-T G.989.3 standard.

62.   On information and belief, Verizon, Verizon NG-PON2 Networks, and

Verizon NG-PON2 Products and Services employ and provide a method of tuning an

upstream wavelength of an optical network unit, (referred to herein as an "ONU"), as

demonstrated by the standards, images, diagrams, tables, and documents cited below.

Upstream tuning timer: This attribute, which corresponds to timer TO5 of G.989.3 expressed as an integer number of PHY frame intervals, specifies the duration of time an ONU in the Upstream tuning (O9) state attempts to obtain the upstream tuning confirmation in the specified target upstream wavelength channel before transitioning into the Initial (O1) state for reactivation. The default value upon instantiation is 1000 (125 ms). (R, W) (mandatory) (4 bytes)

See
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjfoITg
xPfxAhWqFVkFHYaSB1IQFjAAegQIBRAD&url=https%3A%2F%2Fwww.verizon.com%2Fa
bout%2Fsites%2Fdefault%2Ffiles%2FVerizon-OpenOMCI-
Specification.docx&usg=AOvVaw2tutGWSkVKwd1TIV3U7uZ0 at p. 50.

International Telecommunication Union

ITU-T

G.989.3
(10/2015)

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES G: TRANSMISSION SYSTEMS AND
MEDIA,IGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line
systems for local and access networks

40-Gigabit-capable passive optical networks
(NG-PON2): Transmission convergence layer
specification

See T-REC-G.989.3-201510 at p. 1.

17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.
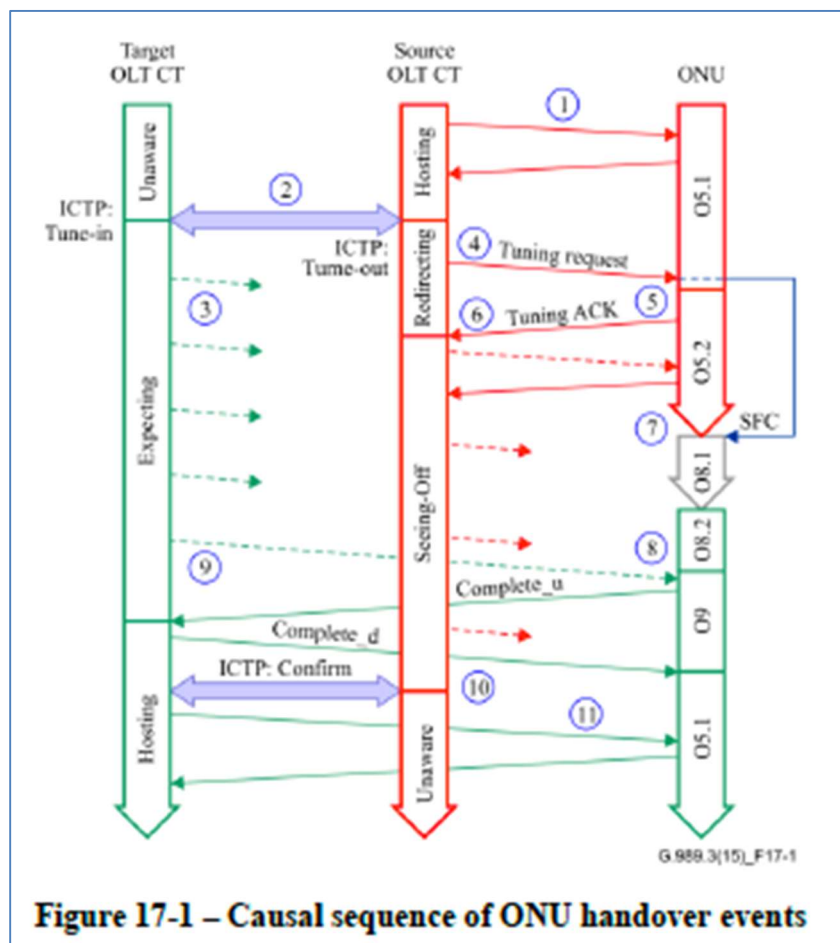
17.3.1   Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1)   Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2)   The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3)   Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4)   Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

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Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

Table 11-3 – Upstream PLOAM messages

Message type ID	Message name (applicability)	Function	Trigger	Effect of receipt
0x1A	Tuning_Response (Specific field formats)	(1) To respond to the Tuning_Control PLOAM message with Request operation code, indicating either the intent or the inability to execute the tuning request, along with the applicable response code (2) To provide an indication of the success or failure of a wavelength tuning operation along with the applicable response code.	When an ONU in the Operation state (O5) receives a Tuning_Control PLOAM message with the Request opcode; or when an ONU in the Upstream Tuning state (O9) receives an upstream in-band or AMCC PLOAM grant upon completion of an upstream wavelength tuning operation, depending on whether or not the ONU meets the specified calibration accuracy constraints.	The OLT CT executes appropriate ICTP transaction commit operation, and generates downstream PLOAM messages, according to the protocol specification of clause 17.
0x1B	Power_Consumption_Report (TWDM only)	To provide power consumption information.	Upon receipt of a Power_Consumption_Inquire message.	The OLT CT tunes the ONU to the optimized TWDM channel for operation in terms of power consumption information.
0x1C	Rate_Response (PtP WDM only)	To respond to the Rate_Control PLOAM message, indicating either the intent or the inability to execute the instruction, along with the applicable response code.	Upon receipt of a Rate_Control message.	The OLT CT either adjusts the line rates according to the instructions, or executes a diagnostic procedure at its discretion.

See T-REC-G.989.3-201510 at p. 71, Figure 11-3.

63.   On information and belief, Verizon, Verizon NG-PON2 Networks, and Verizon NG-PON2 Products and Services employ and provide a method comprising the step of exchanging tuning messages with a target OLT channel termination, ("CT") to initiate upstream wavelength tuning of an ONU, as demonstrated by the standards, images, diagrams, and document cited below.

17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

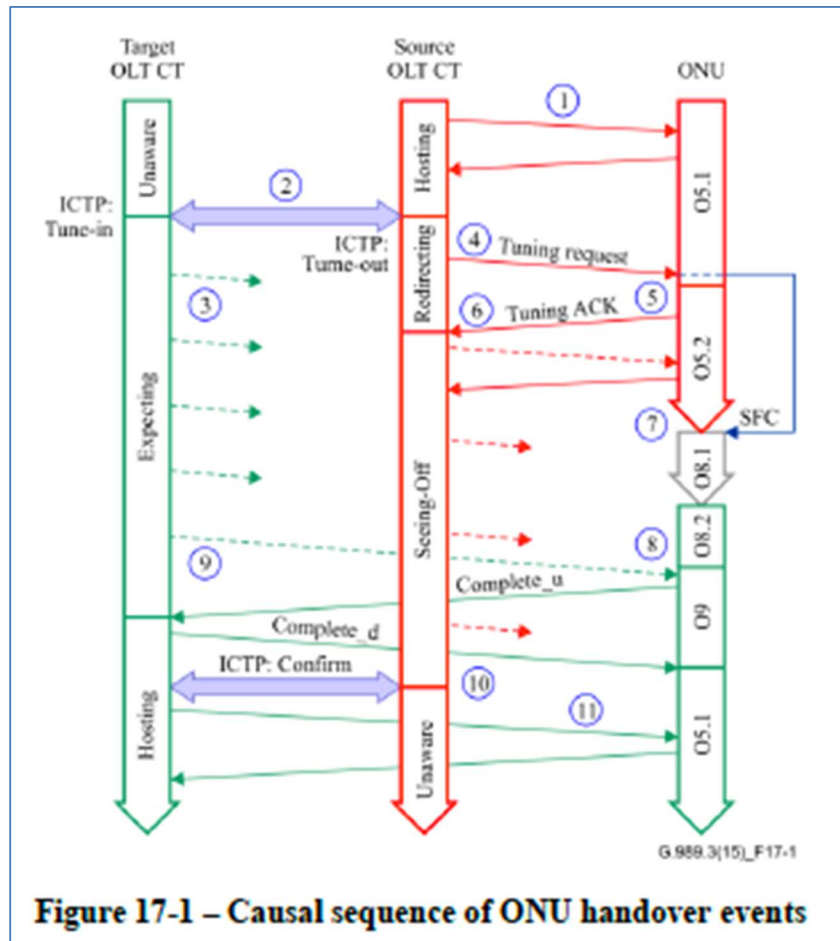**17.3.1   Causal sequence of ONU handover events**

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1)   Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2)   The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3)   Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4)   Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

5)   The ONU evaluates the Tuning request and, if it can be accepted, responds with a Tuning acknowledgement in the form of a Tuning_Response(ACK) PLOAM message and starts the preparations for handover. If ONU cannot accept the Tuning request to any reason, for example, the Scheduled SFC being too close to the current PHY frame, it can reject it with a Tuning_Response(NACK) PLOAM message, providing the appropriate response code.

6)   After the Source OLT CT receives the Tuning acknowledgement, it may continue issuing the ONU directed PLOAM grants, whether or not the ONU responds, to facilitate ONU rollback in case the handover is not successful.

7)   When the Scheduled SFC value matches the 16 least significant bits of the locally maintained SFC copied from the PSBd structure of the downstream PHY frames, the ONU starts tuning its transceiver to the specified downstream and upstream wavelength channels.

8)   Once the ONU completes transceiver tuning and acquires downstream synchronization, it starts parsing the BWmap, and responds to the appropriate PLOAM allocations with a Tuning_Response(Complete_u) PLOAM message. (If the ONU fails to tune its transceiver to the target downstream or upstream wavelength channels and the Source OLT CT has offered the Rollback support, the ONU may restore its transceiver to the source downstream and upstream wavelength channels and announce its return to the Source OLT CT by transmitting a Tuning_Response(ROLLBACK) PLOAM message.)

9)   When the Target OLT CT receives an indication of the ONU arrival, it may issue a Request_Registration PLOAM message to authenticate the ONU. It completes the handshake with the ONU with the Tuning_Control(Complete_d) PLOAM message and starts the ICTP:confHandover transaction with the Source OLT CT. The ONU re-derives the SK, the OMCI_IK, the PLOAM_IK, and the KEK when the PON-TAG in the downstream Burst_Profile PLOAM message changes.

10)   Upon receiving the handover confirmation, the Source OLT CT stops issuing the bandwidth allocations to the ONU, and abandons any data structures associated with it.

11)   The Target OLT CT and the ONU engage in operation exchanging data and PLOAM messages as specified elsewhere in this Recommendation.

See T-REC-G.989.3-201510 at p. 183.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

64.   On information and belief, Verizon, Verizon NG-PON2 Networks, and

Verizon NG-PON2 Products and Services employ and provide a method comprising

the step of transmitting a tuning request to the ONU after the tuning messages have

been exchanged and receiving a tuning acknowledgement message from the ONU

indicating that the tuning request will be executed, as demonstrated by the standards,

images, diagram, table, and document cited below.

17.3 ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.
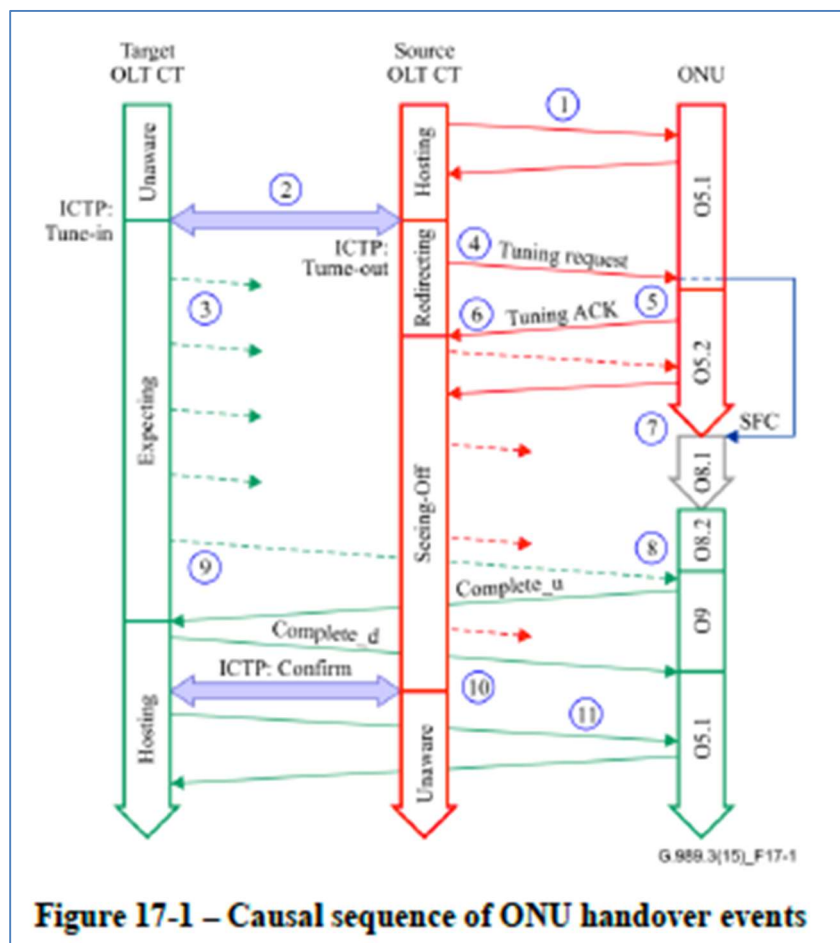
17.3.1 Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1) Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2) The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3) Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4) Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

5) The ONU evaluates the Tuning request and, if it can be accepted, responds with a Tuning acknowledgement in the form of a Tuning_Response(ACK) PLOAM message and starts the preparations for handover. If ONU cannot accept the Tuning request to any reason, for example, the Scheduled SFC being too close to the current PHY frame, it can reject it with a Tuning_Response(NACK) PLOAM message, providing the appropriate response code.

6) After the Source OLT CT receives the Tuning acknowledgement, it may continue issuing the ONU directed PLOAM grants, whether or not the ONU responds, to facilitate ONU rollback in case the handover is not successful.

7) When the Scheduled SFC value matches the 16 least significant bits of the locally maintained SFC copied from the PSBd structure of the downstream PHY frames, the ONU starts tuning its transceiver to the specified downstream and upstream wavelength channels.

8) Once the ONU completes transceiver tuning and acquires downstream synchronization, it starts parsing the BWmap, and responds to the appropriate PLOAM allocations with a Tuning_Response(Complete_u) PLOAM message. (If the ONU fails to tune its transceiver to the target downstream or upstream wavelength channels and the Source OLT CT has offered the Rollback support, the ONU may restore its transceiver to the source downstream and upstream wavelength channels and announce its return to the Source OLT CT by transmitting a Tuning_Response(ROLLBACK) PLOAM message.)

9) When the Target OLT CT receives an indication of the ONU arrival, it may issue a Request_Registration PLOAM message to authenticate the ONU. It completes the handshake with the ONU with the Tuning_Control(Complete_d) PLOAM message and starts the ICTP:confHandover transaction with the Source OLT CT. The ONU re-derives the SK, the OMCI_IK, the PLOAM_IK, and the KEK when the PON-TAG in the downstream Burst_Profile PLOAM message changes.

10) Upon receiving the handover confirmation, the Source OLT CT stops issuing the bandwidth allocations to the ONU, and abandons any data structures associated with it.

11) The Target OLT CT and the ONU engage in operation exchanging data and PLOAM messages as specified elsewhere in this Recommendation.

See T-REC-G.989.3-201510 at p. 183.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

Seeing-Off	The OLT CT hands over of an ONU to another TWDM channel. The OLT CT provides PLOAM allocations to the given ONU-ID on a regular basis, as well as data allocation to drain any possibly fragmented SDUs prior to scheduled start of the tuning procedure, but does not react adversely to the missed allocations. An ICTP confirmation of the successful completion of the tuning procedure disassociates the ONU from the OLT CT, stops timer T_{source} and causes a transition to the Unaware state.
	If the OLT CT receives a rollback request from the ONU, the OLT CT returns to the Hosting state. If timer T_{source} expires without ICTP confirmation, the OLT returns to the Hosting state, but issues a broadcast ICTP alert against the ONU-ID.

Table 17-6 summarizes OLT wavelength handover timers.

See T-REC-G.989.3-201510 at p. 187, Figure 17-6.

65.   On information and belief, Verizon, Verizon NG-PON2 Networks, and Verizon NG-PON2 Products and Services employ and provide a method comprising the step of transmitting a broadcast notification message to all other OLT CTs within

the OLT after receipt of the tuning acknowledge message from the ONU, wherein the

broadcast notification message includes a tuning time of the ONU, as demonstrated by

the standards, images, diagram, tables, and document cited below.

17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

17.3.1   Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1)   Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2)   The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3)   Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4)   Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.
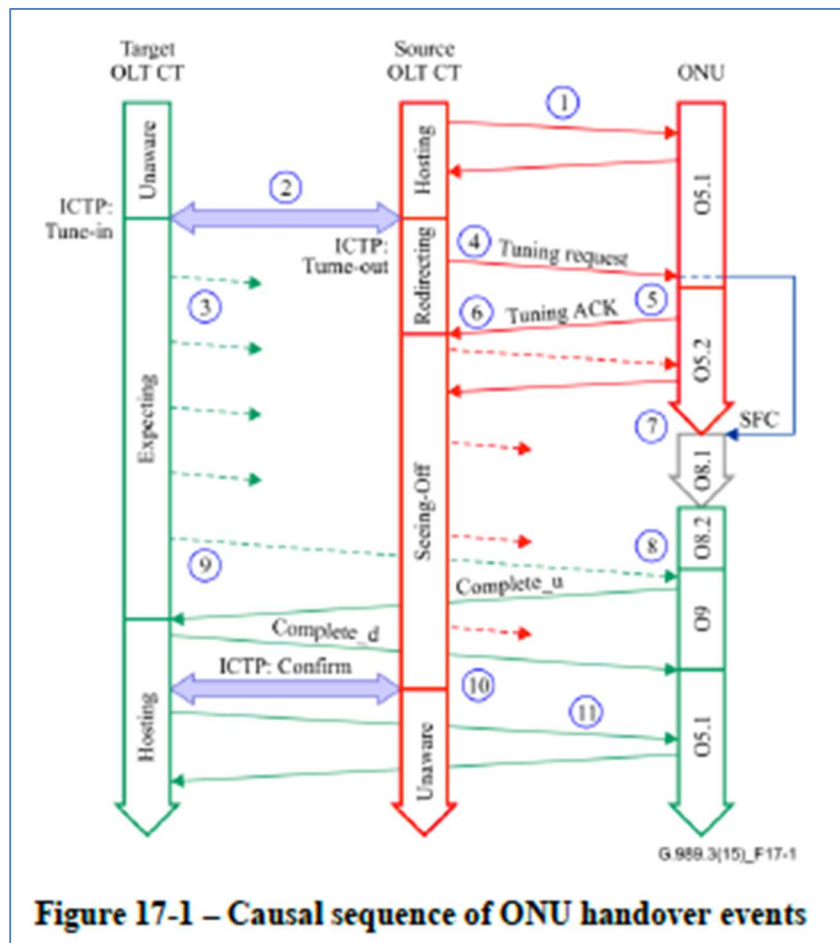
See T-REC-G.989.3-201510 at p. 182.

5) The ONU evaluates the Tuning request and, if it can be accepted, responds with a Tuning acknowledgement in the form of a Tuning_Response(ACK) PLOAM message and starts the preparations for handover. If ONU cannot accept the Tuning request to any reason, for example, the Scheduled SFC being too close to the current PHY frame, it can reject it with a Tuning_Response(NACK) PLOAM message, providing the appropriate response code.

6) After the Source OLT CT receives the Tuning acknowledgement, it may continue issuing the ONU directed PLOAM grants, whether or not the ONU responds, to facilitate ONU rollback in case the handover is not successful.

7) When the Scheduled SFC value matches the 16 least significant bits of the locally maintained SFC copied from the PSBd structure of the downstream PHY frames, the ONU starts tuning its transceiver to the specified downstream and upstream wavelength channels.

8) Once the ONU completes transceiver tuning and acquires downstream synchronization, it starts parsing the BWmap, and responds to the appropriate PLOAM allocations with a Tuning_Response(Complete_u) PLOAM message. (If the ONU fails to tune its transceiver to the target downstream or upstream wavelength channels and the Source OLT CT has offered the Rollback support, the ONU may restore its transceiver to the source downstream and upstream wavelength channels and announce its return to the Source OLT CT by transmitting a Tuning_Response(ROLLBACK) PLOAM message.)

9) When the Target OLT CT receives an indication of the ONU arrival, it may issue a Request_Registration PLOAM message to authenticate the ONU. It completes the handshake with the ONU with the Tuning_Control(Complete_d) PLOAM message and starts the ICTP:confHandover transaction with the Source OLT CT. The ONU re-derives the SK, the OMCI_IK, the PLOAM_IK, and the KEK when the PON-TAG in the downstream Burst_Profile PLOAM message changes.

10) Upon receiving the handover confirmation, the Source OLT CT stops issuing the bandwidth allocations to the ONU, and abandons any data structures associated with it.

11) The Target OLT CT and the ONU engage in operation exchanging data and PLOAM messages as specified elsewhere in this Recommendation.

See T-REC-G.989.3-201510 at p. 183.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

Seeing-Off	The OLT CT hands over of an ONU to another TWDM channel. The OLT CT provides PLOAM allocations to the given ONU-ID on a regular basis, as well as data allocation to drain any possibly fragmented SDUs prior to scheduled start of the tuning procedure, but does not react adversely to the missed allocations. An ICTP confirmation of the successful completion of the tuning procedure disassociates the ONU from the OLT CT, stops timer T_{source} and causes a transition to the Unaware state. If the OLT CT receives a rollback request from the ONU, the OLT CT returns to the Hosting state. If timer T_{source} expires without ICTP confirmation, the OLT returns to the Hosting state, but issues a broadcast ICTP alert against the ONU-ID.

Table 17-6 summarizes OLT wavelength handover timers.

See T-REC-G.989.3-201510 at p. 187, Figure 17-6.

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Table 17-6 – OLT wavelength handover timers

Timer	Full name	State	Semantics and initial value
T_{source}	Source OLT wavelength handover wait timer	Redirecting, Seeing-Off	Timer T_{source} limits the duration of OLT CT's wait for the ONU to complete tuning after the Tune-Out handover transaction has been committed. This timer should be longer than T_{target}.
T_{target}	Target OLT wavelength handover wait timer	Expecting	Timer T_{target} limits the duration of OLT CT's wait for the ONU arrival after the Tune-In handover transaction has been committed.

See T-REC-G.989.3-201510 at p. 188, Figure 17-6.

66.   On information and belief, Verizon directly infringes at least claims 1 and 14 of the '506 patent, and is in violation of 35 U.S.C. § 271(a) by making, using, selling, and offering to sell the Verizon NG-PON2 Products and Services and making, using, selling access to, and offering to sell access to the Verizon NG-PON2 Networks.

67.   Verizon's direct infringement has damaged Couture and caused it to suffer and continue to suffer irreparable harm and damages.

Count II – Infringement of United States Patent No. 9,819,437

68.   Couture repeats, realleges, and incorporates by reference, as if fully set forth here, the allegations of the preceding paragraphs above.

69.   On information and belief, Verizon (or those acting on its behalf) makes, uses, sells, and/or offers to sell access to the Verizon NG-PON2 Networks and makes, uses, sells, and/or offers for sale the Verizon NG-PON2 Products and Services in the United States. Verizon, as well as the Verizon NG-PON2 Networks and Verizon NG-PON2 Products and Services, infringe (literally and/or under the doctrine of equivalents) at least claims 1 and 14 of the '437 patent.

70.   On information and belief, on or about June 30, 2017, Verizon released,

published, and/or otherwise disseminated the "Verizon OpenOMCI Specification

version 1.00."[5] The Verizon OpenOMCI Specification provides that "the Verizon

OpenOMCI specification: … makes necessary extensions to support NG-PON2 multi-

wavelength channel architecture and the new features introduced by the NG-PON2

PMD and TC layer specifications, G.989.2 and G.989.3."[6] The Verizon OpenOMCI

Specification further provides that "[g]overned by the objective of achieving

interoperability while meeting the Verizon NG-PON2 system requirements, Verizon

OpenOMCI extends the existing G.988 MEs with the new MEs that: … support the

G.989.3-specified OMCI-based functions (CPI management, wavelength management

and protection, enhanced performance monitoring) …. For the NGPON2 equipment

deployed in the Verizon network, the compliance with Verizon OpenOMCI

specification is required."[7]

71.   On information and belief, the Verizon NG-PON2 Networks and the

hardware and software that enable the Verizon NG-PON2 Networks to function as

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[5] *See*
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjfoITg
xPfxAhWqFVkFHYaSB1IQFjAAegQIBRAD&url=https%3A%2F%2Fwww.verizon.com%2Fa
bout%2Fsites%2Fdefault%2Ffiles%2FVerizon-OpenOMCI-
Specification.docx&usg=AOvVaw2tutGWSkVKwd1TIV3U7uZ0

[6] *Id*. at p. 3.

[7] *Id*. at p. 10.

intended conform to the requirements of the Verizon OpenOMCI specification

standard.

72.   On information and belief, the Verizon NG-PON2 Networks and the

hardware and software that enable the Verizon NG-PON2 Networks to function as

intended conform to the requirements of the ITU-T G.989.3 standard.

73.   On information and belief, Verizon, Verizon NG-PON2 Networks, and

Verizon NG-PON2 Products and Services employ and provide a method of tuning an

upstream wavelength of an ONU implemented in a source OLT CT, as demonstrated by

the standards, images, diagram, and documents cited below.

Upstream tuning timer: This attribute, which corresponds to timer TO5 of G.989.3 expressed as an integer number of PHY frame intervals, specifies the duration of time an ONU in the Upstream tuning (O9) state attempts to obtain the upstream tuning confirmation in the specified target upstream wavelength channel before transitioning into the Initial (O1) state for reactivation. The default value upon instantiation is 1000 (125 ms). (R, W) (mandatory) (4 bytes)

See
https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjfoITg
xPfxAhWqFVkFHYaSB1IQFjAAegQIBRAD&url=https%3A%2F%2Fwww.verizon.com%2Fa
bout%2Fsites%2Fdefault%2Ffiles%2FVerizon-OpenOMCI-
Specification.docx&usg=AOvVaw2tutGWSkVKwd1TIV3U7uZ0 at p. 50.

International Telecommunication Union

ITU-T

G.989.3
(10/2015)

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

SERIES G: TRANSMISSION SYSTEMS AND
MEDIA,IGITAL SYSTEMS AND NETWORKS

Digital sections and digital line system – Optical line
systems for local and access networks

40-Gigabit-capable passive optical networks (NG-PON2): Transmission convergence layer specification

See T-REC-G.989.3-201510 at p. 1.

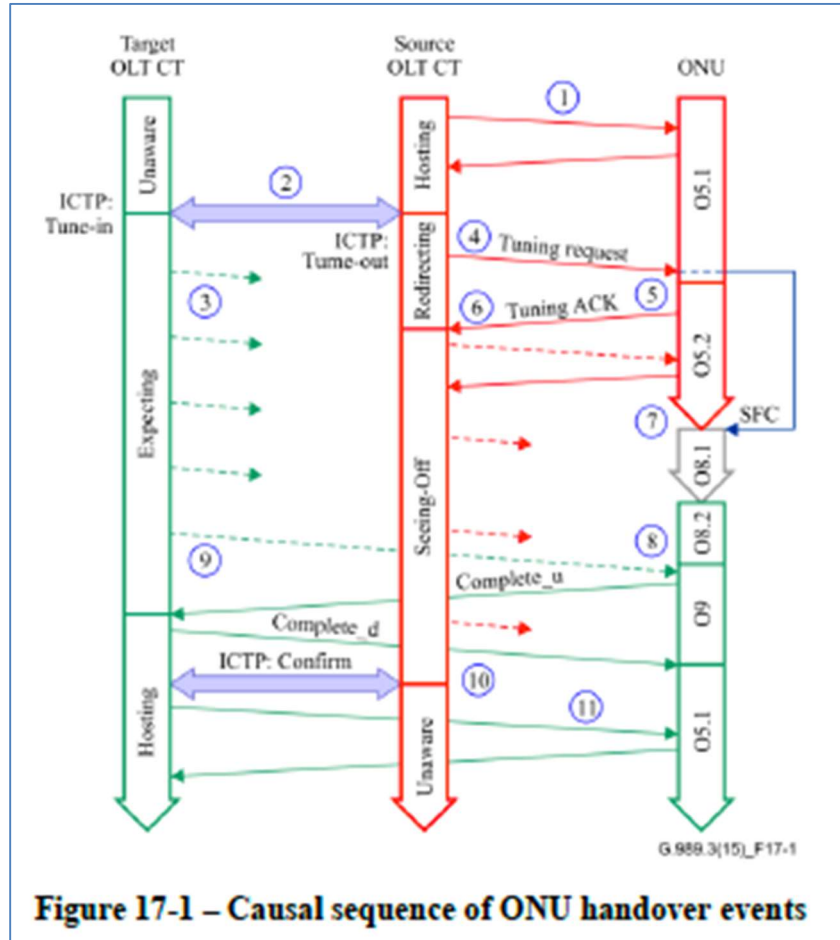### 17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

17.3.1   Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1)   Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2)   The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3)   Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4)   Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

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Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

74.   On information and belief, Verizon, Verizon NG-PON2 Networks, and

Verizon NG-PON2 Products and Services employ and provide a method comprising

the step of exchanging tuning messages with a target OLT CT to initiate upstream

wavelength tuning of the ONU, as demonstrated by the standards, images, diagram,

and document cited below.
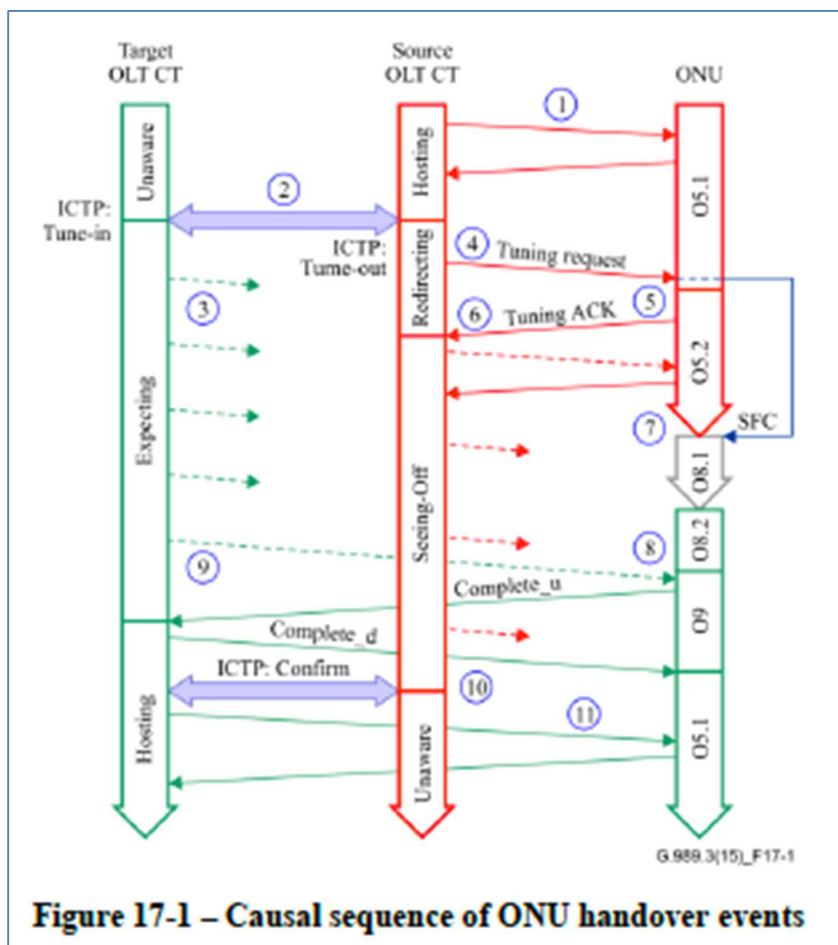
17.3 ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

17.3.1 Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1) Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2) The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3) Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4) Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

75.   On information and belief, Verizon, Verizon NG-PON2 Networks, and Verizon NG-PON2 Products and Services employ and provide a method comprising the step of transmitting a tuning request to the ONU after the tuning messages have been exchanged, as demonstrated by the standards, images, diagram, and document cited below.
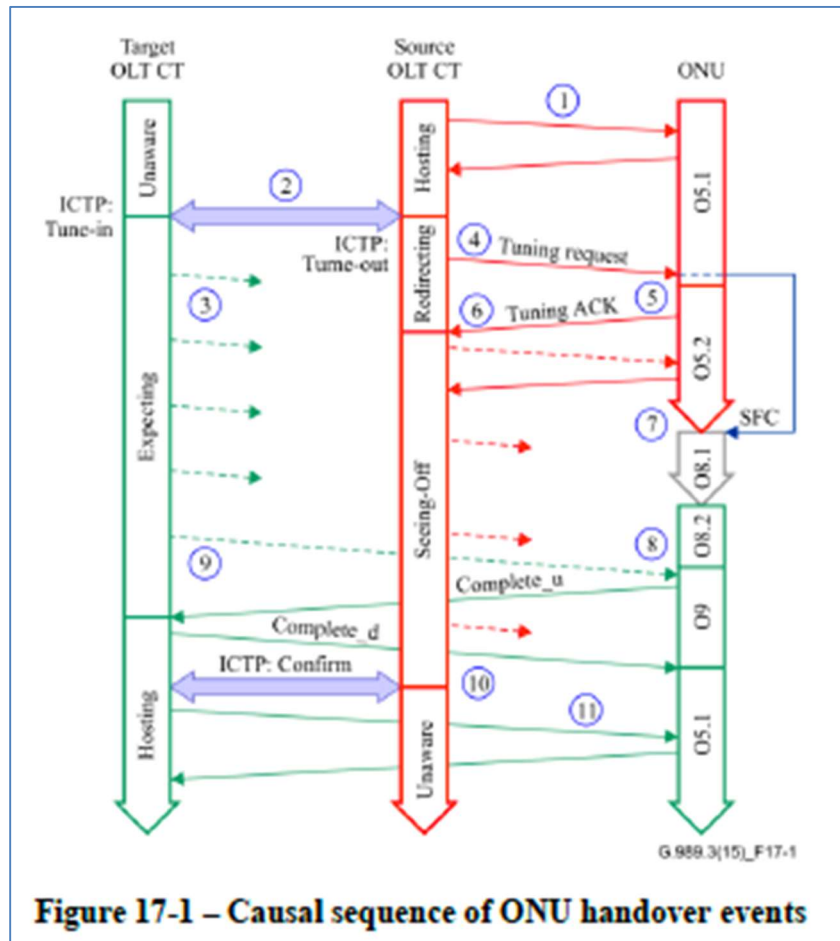
40

17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

17.3.1   Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1)   Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2)   The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3)   Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4)   Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

76.   On information and belief, Verizon, Verizon NG-PON2 Networks, and Verizon NG-PON2 Products and Services employ and provide a method comprising the step of transmitting a broadcast notification message comprising a tuning time of the ONU to the target OLT CT and at least one other OLT after receipt of the tuning acknowledge message from the ONU, as demonstrated by the standards, images, diagram, tables, and document cited below.

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17.3   ONU wavelength channel handover

This clause describes a pre-planned ONU handover between two TWDM channels. A pre-planned ONU handover may take place upon ONU activation, during the load balancing operation, in support of the OLT software upgrade, in the course of execution of an OLT power saving, OLT pay-as-you-grow, rogue ONU mitigation procedure and in other situations.

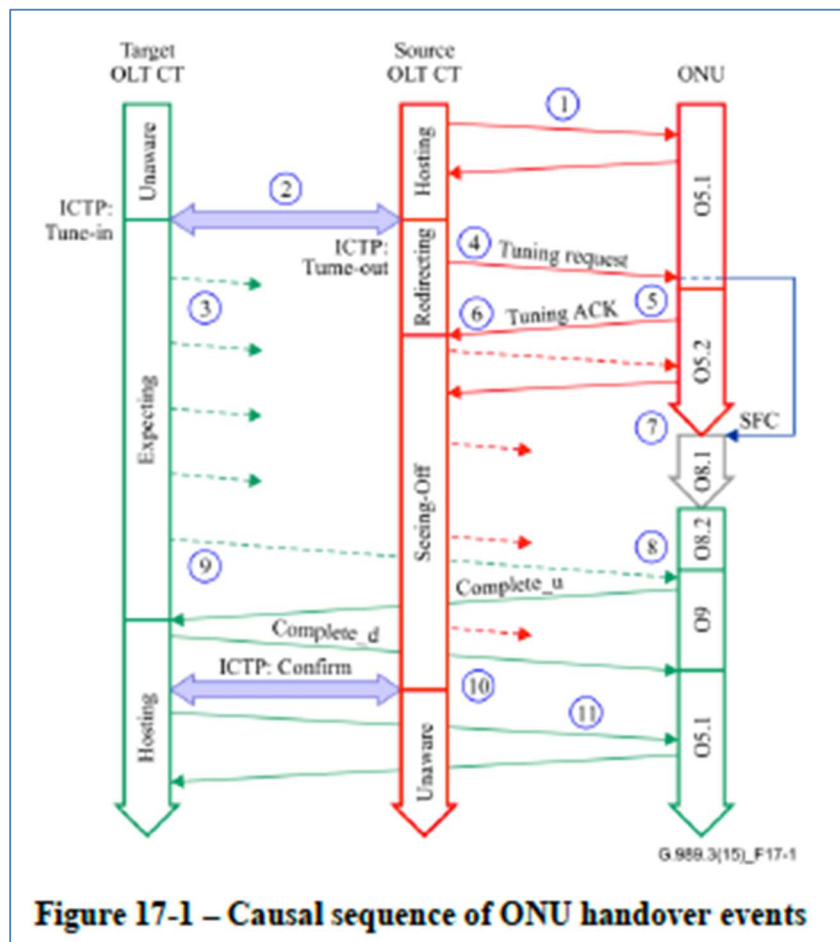#### 17.3.1   Causal sequence of ONU handover events

The following description refers to Figure 17-1, which represents a causal sequence of events involved in a successful handover. The ONU activation cycle states are referred to in clause 12. The OLT CT states (Unaware, Expecting, Hosting, Redirecting and Seeing-Off) are explained in clause 17.3.3. In the figure, the solid slanted arrow represents a data or PLOAM transmission, a dashed arrow – a PLOAM allocation and a horizontal bar – an ICTP interaction. See clause VI.2 for ICTP primitives description.

1) Initially, the ONU is hosted by the Source OLT channel termination (CT), and the two NEs exchange data and PLOAM messages as specified elsewhere in this Recommendation.

2) The Source OLT CT and the Target OLT CT execute a transaction over the ICTP resolving that the ONU is to be handed from the Source OLT CT to the Target OLT CT. The transaction is committed with the Source OLT CT receiving the ICTP:Tune-Out indication, and the Target OLT CT receiving the ICTP:Tune-In indication.

3) Upon committing the ONU handover transaction, the Target OLT CT instantiates necessary data structures to support the ONU, begins issuing periodic directed PLOAM grants to the ONU, ensuring that the appropriate guard time is provided, and starts the T_{target} timer which controls the duration of the handover operation from the perspective of the Target OLT CT.

4) Upon committing the ONU handover transaction, the Source OLT CT starts the T_{source} timer, which controls the duration of the handover operation from the perspective of Source OLT CT, and sends a Tuning request to the ONU in the form of a Tuning_Control PLOAM message, specifying the downstream and upstream wavelength channels of the Target TWDM channel, the Scheduled SFC value, that is, the 16 least significant bits of the SFC of the PHY frame when the transceiver tuning is scheduled to commence, and the Rollback support indication.

See T-REC-G.989.3-201510 at p. 182.

5) The ONU evaluates the Tuning request and, if it can be accepted, responds with a Tuning acknowledgement in the form of a Tuning_Response(ACK) PLOAM message and starts the preparations for handover. If ONU cannot accept the Tuning request to any reason, for example, the Scheduled SFC being too close to the current PHY frame, it can reject it with a Tuning_Response(NACK) PLOAM message, providing the appropriate response code.

6) After the Source OLT CT receives the Tuning acknowledgement, it may continue issuing the ONU directed PLOAM grants, whether or not the ONU responds, to facilitate ONU rollback in case the handover is not successful.

7) When the Scheduled SFC value matches the 16 least significant bits of the locally maintained SFC copied from the PSBd structure of the downstream PHY frames, the ONU starts tuning its transceiver to the specified downstream and upstream wavelength channels.

8) Once the ONU completes transceiver tuning and acquires downstream synchronization, it starts parsing the BWmap, and responds to the appropriate PLOAM allocations with a Tuning_Response(Complete_u) PLOAM message. (If the ONU fails to tune its transceiver to the target downstream or upstream wavelength channels and the Source OLT CT has offered the Rollback support, the ONU may restore its transceiver to the source downstream and upstream wavelength channels and announce its return to the Source OLT CT by transmitting a Tuning_Response(ROLLBACK) PLOAM message.)

9) When the Target OLT CT receives an indication of the ONU arrival, it may issue a Request_Registration PLOAM message to authenticate the ONU. It completes the handshake with the ONU with the Tuning_Control(Complete_d) PLOAM message and starts the ICTP:confHandover transaction with the Source OLT CT. The ONU re-derives the SK, the OMCI_IK, the PLOAM_IK, and the KEK when the PON-TAG in the downstream Burst_Profile PLOAM message changes.

10) Upon receiving the handover confirmation, the Source OLT CT stops issuing the bandwidth allocations to the ONU, and abandons any data structures associated with it.

11) The Target OLT CT and the ONU engage in operation exchanging data and PLOAM messages as specified elsewhere in this Recommendation.

See T-REC-G.989.3-201510 at p. 183.

Figure 17-1 – Causal sequence of ONU handover events

See T-REC-G.989.3-201510 at p. 184, Figure 17-1.

Seeing-Off	The OLT CT hands over of an ONU to another TWDM channel. The OLT CT provides PLOAM allocations to the given ONU-ID on a regular basis, as well as data allocation to drain any possibly fragmented SDUs prior to scheduled start of the tuning procedure, but does not react adversely to the missed allocations. An ICTP confirmation of the successful completion of the tuning procedure disassociates the ONU from the OLT CT, stops timer T_{source} and causes a transition to the Unaware state. If the OLT CT receives a rollback request from the ONU, the OLT CT returns to the Hosting state. If timer T_{source} expires without ICTP confirmation, the OLT returns to the Hosting state, but issues a broadcast ICTP alert against the ONU-ID.

Table 17-6 summarizes OLT wavelength handover timers.

See T-REC-G.989.3-201510 at p. 187, Figure 17-6.

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Table 17-6 – OLT wavelength handover timers

Timer	Full name	State	Semantics and initial value
T_{source}	Source OLT wavelength handover wait timer	Redirecting, Seeing-Off	Timer T_{source} limits the duration of OLT CT's wait for the ONU to complete tuning after the Tune-Out handover transaction has been committed. This timer should be longer than T_{target}.
T_{target}	Target OLT wavelength handover wait timer	Expecting	Timer T_{target} limits the duration of OLT CT's wait for the ONU arrival after the Tune-In handover transaction has been committed.

See T-REC-G.989.3-201510 at p. 188, Figure 17-6.

Table 11-3 – Upstream PLOAM messages

Message type ID	Message name (applicability)	Function	Trigger	Effect of receipt
0x1A	Tuning_Response (Specific field formats)	(1) To respond to the Tuning_Control PLOAM message with Request operation code, indicating either the intent or the inability to execute the tuning request, along with the applicable response code (2) To provide an indication of the success or failure of a wavelength tuning operation along with the applicable response code.	When an ONU in the Operation state (O5) receives a Tuning_Control PLOAM message with the Request opcode; or when an ONU in the Upstream Tuning state (O9) receives an upstream in-band or AMCC PLOAM grant upon completion of an upstream wavelength tuning operation, depending on whether or not the ONU meets the specified calibration accuracy constraints.	The OLT CT executes appropriate ICTP transaction commit operation, and generates downstream PLOAM messages, according to the protocol specification of clause 17.
0x1B	Power_Consumption_Report (TWDM only)	To provide power consumption information.	Upon receipt of a Power_Consumption_Inquire message.	The OLT CT tunes the ONU to the optimized TWDM channel for operation in terms of power consumption information.
0x1C	Rate_Response (PtP WDM only)	To respond to the Rate_Control PLOAM message, indicating either the intent or the inability to execute the instruction, along with the applicable response code.	Upon receipt of a Rate_Control message.	The OLT CT either adjusts the line rates according to the instructions, or executes a diagnostic procedure at its discretion.

See T-REC-G.989.3-201510 at p. 71, Figure 11-3.

77.   On information and belief, Verizon directly infringes at least claims 1 and

14 of the '437 patent and is in violation of 35 U.S.C. § 271(a) by making, using, selling,

and offering to sell the Verizon NG-PON2 Products and Services and making, using,

selling access to, and offering to sell access to the Verizon NG-PON2 Networks.

78.   Verizon's direct infringement has damaged Couture and caused it to

suffer and continue to suffer irreparable harm and damages.

JURY DEMANDED

79.   Pursuant to Federal Rule of Civil Procedure 38(b), Couture hereby

requests a trial by jury on all issues so triable.

PRAYER FOR RELIEF

Couture respectfully requests this Court to enter judgment in Couture's favor

and against Verizon as follows:

a. finding that Verizon has infringed one or more claims of the '506 patent under 35

   U.S.C. §§ 271(a);

b. finding that Verizon has infringed one or more claims of the '437 patent under 35

   U.S.C. §§ 271(a);

c. awarding Couture damages under 35 U.S.C. § 284, or otherwise permitted by

   law, including supplemental damages for any continued post-verdict

   infringement;

d. awarding Couture pre-judgment and post-judgment interest on the damages

   award and costs;

e. awarding cost of this action (including all disbursements) and attorney fees

   pursuant to 35 U.S.C. § 285, or as otherwise permitted by the law; and

f.   awarding such other costs and further relief that the Court determines to be just

and equitable.

Dated: July 28, 2021   Respectfully submitted,

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