UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TEXAS
MARSHALL DIVISION

DIFF SCALE OPERATION RESEARCH, LLC, ***Plaintiff,*** v. **CISCO SYSTEMS, INC.** ***Defendant.***	**Civil Action No._____** **JURY TRIAL DEMANDED**

COMPLAINT FOR PATENT INFRINGEMENT

DIFF Scale Operation Research, LLC ("Plaintiff"), by its undersigned counsel, bring this action and make the following allegations of patent infringement relating to U.S. Patent Nos.: 7,881,413 (the, "'413 patent"); 6,664,827 (the, "'827 patent"); 7,106,758 (the, "'758 patent"); 6,407,983 (the, "'983 patent"); 6,847,609 (the, "'609 patent"); 6,940,810 (the, "'810 patent"); 6,990,110 (the, "'110 patent"); 6,721,328 (the, "'328 patent"); and 6,216,166 (the, "'166 patent"); and 6,859,430 (the, "'430 patent") (collectively, the "patents-in-suit"). Defendant Cisco Systems, Inc. ("Cisco" or "Defendant") infringes each of the patents-in-suit in violation of the patent laws of the United States of America, 35 U.S.C. § 1 *et seq.*

INTRODUCTION

1. This case arises from Cisco's infringement of a portfolio of semiconductor and network infrastructure patents. This patent portfolio arose from the groundbreaking work of ADC Telecommunications, Inc. ("ADC Telecommunications").

2. In 1935, ADC Telecommunications, then known as the Audio Development Company[1] was founded in Minneapolis, Minnesota by two Bell Laboratory engineers to create custom transformers and amplifiers for the broadcast radio industry. In the 1950s, ADC Telecommunications began to produce jacks, plugs, patch cords, and jack fields, which would be cornerstones for ADC Telecommunications' later entry into telecommunications equipment.[2]

3. In the late 1990s, ADC Telecommunications pioneered the development of microchips and network switches for the burgeoning telecommunications industry.[3] ADC Telecommunications' products included fiber-optic video, data, and voice transmission systems, and its clients included all the major domestic cable TV operators, numerous phone companies, and a majority of TV broadcasters.[4]

4. Prior licensing of ADC Telecommunications' patents confirms the significant value of ADC Telecommunications' innovations. In 2011, HTC the Taiwan based smartphone manufacturer, bought a portfolio of 82 patents and 14 pending applications related to mobile technology from ADC Telecommunications.[5] HTC asserted two of these patents against Apple before the International Trade Commission.

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[1] Audio Development Company was later renamed ADC Telecommunications, Inc. *U.S. Senate Executive Reports*, U.S. PRINTING OFFICE at 39 (1999) ("The story of ADC Telecommunications begins in 1935, the height of the great depression . . . . The company got its start with a new innovation called the audiometer, an electronic device designed to test hearing.").

[2] *High Fidelity Audio Devices Boost Capitol Diskery Sales*, BILLBOARD MAGAZINE at 12 (August 8, 1950) (describing Audio Development Company's amplifiers).

[3] David Beal, *Seeing the Light; ADC Telecommunications Has Grown From Making Telephone Jacks And Plugs Into A Force For The Global Fiber-Optic Future*, ST. PAUL PIONEER PRESS at E1 (December 25, 1995).

[4] George Lawton, *Fiber Optic Architecture Evolution Evident at Cable-TV Exhibition*, LIGHTWAVE MAGAZINE (August 1, 1995) ("Cable-Tec Expo's exhibition area featured new fiber-optic products and technologies for the optical-fiber and cable-TV industries. For example, Minneapolis-based ADC Telecommunications Inc.")

[5] *HTC Buys Patents from ADC Telecommunications for $75 million*, THE NATIONAL LAW REVIEW (April 19, 2011), *available at*: https://www.natlawreview.com/article/htc-buys-patents-

> Apple Inc. may face a difficult task invalidating two HTC Corp. patents for data transmission in wireless devices, a U.S. Trade Judge said at a trial that could lead to import bans on the newest iPad and the next version of the iPhone. . . In this case, though, HTC acquired the patents at issue in April 2011, around the same time it began selling its first LTE phone, the Thunderbolt. ***The patents are part of a portfolio HTC bought for $75 million from ADC Telecommunications Inc.*** [Judge] Pender told McKeon. "They are a property right."

Susan Decker, *HTC Patents Challenged by Apple Probably Valid, Judge Says*, BLOOMBERG NEWS (September 7, 2012) (emphasis added).

5. HTC's assertion of two patents acquired from ADC Telecommunications was described by commentators as forcing Apple to the negotiating table following a series of lawsuits between Apple and HTC:

> A separate case before the ITC may have ***forced Mr. Cook to the negotiating table*** after a judge at the agency said Apple would be likely to face difficulty getting a series of HTC patents invalidated. ***HTC bought those patents, which covered technology used in LTE high-speed wireless devices, from ADC Telecommunications for US $75 million***. "The settlement is a big surprise and is likely due to HTC's LTE patents, which is bought from ADC last year, as Apple's LTE patents are relatively weak," said Jeff Pu, an analyst from Fubon Financial Holding Co.

Apple Settles HTC Patent Suits, Signaling Shift from Jobs' War Plan, FINANCIAL POST / BLOOMBERG NEWS (November 12, 2012) (emphasis added).

6. ADC Telecommunication's revolutionary products included Homeworx Hybrid Fiber/Coax Access Platform ("ADC Homeworx").[6] ADC Homeworx was an integrated broadband transport system that could deliver video, telephony, data, and other services over a network of fiber optic and coaxial cables.[7] The ADC Homeworx network utilized fiber-optic and radio

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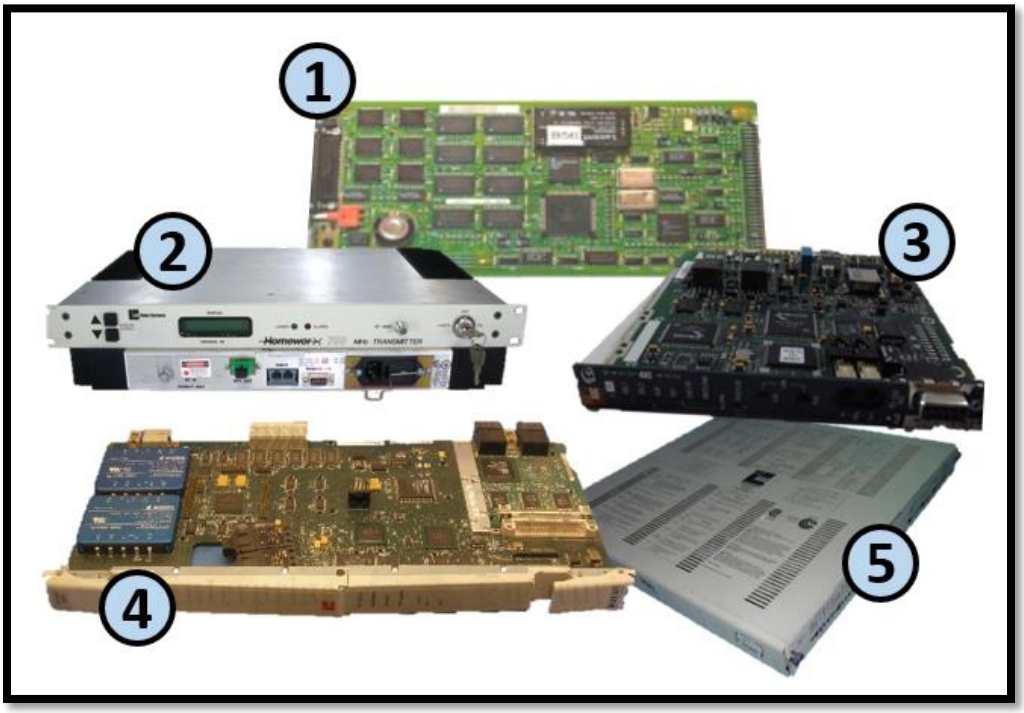
adc-telecommunications-75-million ("HTC, the Taiwan based smartphone manufacturer, has bought a portfolio of 82 patents and 14 pending applications related to mobile technology from US based ADC Telecommunications.").

[6] Sue Boyle, *Cable-Telephony Platform,* LIGHTWAVE MAGAZINE Vol. 17; No. 16 at 185 (September 1, 2000) ("The Homeworx cable-telephony system adds new features to the carrier-class hybrid fiber/coaxial telephony platform. The system offers improvements in flexibility, manageability, and robustness.").

[7] *Homeworx HFC Access Platform Outdoor ISU-32 Integrated Services Unit Installation Manual,* ADC Telecommunications Manual at 1-1 (July 1999).

frequency transmission technologies for transporting various services over a network.[8] ADC Telecommunications' groundbreaking products also included: the Soneplex Platform, CityCell, Cellworx STN Service, the EZT1 Voice Multiplexer, FOLENS (Fiber Optic Local Exchange Network System), and the DS3 Fiber Loop Converter. [9]



ANNOTATED GRAPHIC OF SELECTED ADC TELECOMMUNICATIONS PRODUCTS (numbered annotations showing: (1) ADC Soneplex SPX MPU Board MC68302; (2) ADC Homeworx 750MHz XMTR; (3) ADC HiGain HDSL4 Remote Unit H4TUR402L53; (4) ADC Cellworx BA4IKKLBAA; and (5) ADC Telecommunications EZT1 Access Multiplexer).

[8] *ADC AT&T Bis Team for Cable Telephony,* CABLE WORLD MAGAZINE Vol. 11 at 28 (May 31, 1999) ("The company's Homeworx cable telephony platform has the largest capacity in the fledgling 6 MHz bandwidth channel compared to conventional telephone carriers.").

[9] *Modems, Test Gear, Return Path Hot at Expo*, CED MAGAZINE (June 30, 1997), *available at:* https://www.cedmagazine.com/article/1997/06/modems-test-gear-return-path-hot-expo ("ADC Telecommunications introduced a new forward path receiver that extends performance to 860 MHz for cable TV and telephony applications.").

7. By 1999, ADC Telecommunications had almost 10,000 employees and annual sales of 1.5 billion dollars. Although ADC Telecommunications was a leading innovator in its field, it was a mid-sized company in a market dominated by multinational corporations.[10]

8. A 1999 New York Times article on the telecommunication industry foreshadowed the difficulties that ADC Telecommunications would face when competing against much large competitors who were able to use their market power to dominate the market at the expense of smaller players:

> Cisco's is not the only approach in the M.M.D.S. broad-band data market, however. The company's wireless competitors will include Spike Technologies, ADC Telecommunications and Adaptive Broadband. But ***Cisco's prominence as an Internet technology vendor, along with the powerful alliance it has built, could give the company an inside edge,*** some analysts said.

John Markoff, *Cisco to Offer More Details on Wireless Technology,* N.Y. TIMES a C-1 (November 29, 1999) (emphasis added).

9. In 2015, ADC Telecommunications (including its foundational intellectual property) were acquired by CommScope, Inc. ("CommScope"). CommScope, a spin-off of General Instrument Corporation, manufactures optical fiber cabling, multiplexers, and telecommunications antennas.

10. To facilitate the licensing of ADC Telecommunications' technology, CommScope assigned 73 patents and patent applications covering ADC Telecommunications' pioneering innovations relating to electronic circuits for timing and network traffic management to DIFF Scale Operation Research. DIFF Scale Operation Research protects and licenses ADC Telecommunications' inventions, which are widely adopted by leading technology companies.

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[10] Barnaby J. Feder, *Optical Fiber (Almost at Home),* N.Y. TIMES at F-6 (March 24, 1991) ("AT&T's competitors range from giants like Alcatel of France and Fujitsu of Japan to mid-sized companies like ADC Telecommunications Inc.").

11. Highlighting the importance of the patents-in-suit is the fact that the patents-in-suit have been cited by over 600 U.S. Patents and Patent Applications by a wide variety of the largest companies operating in the field. For example, the patents-in-suit have been cited by companies such as:

- International Business Machines Corporation[11]
- Apple, Inc.[12]
- Intel Corporation[13]
- Broadcom Corporation[14]
- Microsoft Corporation[15]
- Sony Corporation[16]
- ***Cisco Systems, Inc***.[17]
- Hewlett-Packard Enterprise Company[18]
- Huawei Technologies Co., Ltd.[19]
- Alcatel-Lucent S.A.[20]
- Fujitsu Ltd.[21]
- Panasonic Corporation[22]
- Telefonaktiebolaget L.M. Ericsson[23]
- NEC Corporation[24]

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[11] *See, e.g.*, U.S. Patent Nos. 7,894,478; 8,270,296; 8,559,460; 7,398,326; 7,827,317; 7,321,648; and 7,746,777.

[12] *See, e.g.*, U.S. Patent Nos. 9,026,680; 7,457,302; and 8,275,910.

[13] *See, e.g.*, U.S. Patent Nos. 7,248,246; 7046675; 7,263,557; 7,903,560; 8,233,506; 7,248,246; 6,507,915; 6,996,632; 7,346,099; and 7,673,073.

[14] *See, e.g.*, U.S. Patent Nos. 7,161,935; 7,203,227; 7,436,849; 7,724,661; 8,401,025; 8,411,705; 8,462,819; and 9,544,638.

[15] *See, e.g.*, U.S. Patent Nos. 7,526,677; 7,533,407; 7,793,096; 7,827,545; and 9,225,684.

[16] *See, e.g.*, U.S. Patent No. 8,200,873.

[17] *See, e.g.*, U.S. Patent Nos. 7,023,883; 7,523,185; 7,631,055; 7,653,924; 7,751,412; 8,144,591; 8,289,873; 8,379,648; and 8,811,281.

[18] *See, e.g.*, U.S. Patent Nos. 7,103,654; 7,187,674; 7,266,598; and 7,478,260.

[19] *See, e.g.*, U.S. Patent Nos. 7,664,051 and 7,916,758.

[20] *See, e.g.*, U.S. Patent Nos. 6,798,741; 6,895,004; 7,209,530; 7,525,913; 7,536,716; 7,583,689; 7,602,701; and 8,379,509.

[21] *See, e.g.*, U.S. Patent Nos. 6,647,012; 7,330,057; 7,450,505; 7,469,298; and 7,664,217.

[22] *See, e.g.*, U.S. Patent Nos. 8,648,632 and 7,457,979.

[23] *See, e.g.*, U.S. Patent Nos. 8,780,695 and 7,215,664.

[24] *See, e.g.*, U.S. Patent Nos. 6,218,875; 6,707,823; 6,810,497; 6,885,676; and 7,486,663.

- Marvell Technology Group, Limited[25]

THE PARTIES

DIFF SCALE OPERATION RESEARCH, LLC

12. DIFF Scale Operation Research, LLC ("DIFF Scale Operation Research") is a limited liability company organized under the laws of Delaware. DIFF Scale Operation Research is committed to advancing the current state of electronic circuitry and network infrastructure.

13. Brooks Borchers, a former leader of research and development divisions at Boston Scientific Corporation, is the president and owner of DIFF Scale Operation Research, LLC.

14. In an effort to obtain compensation for ADC Telecommunications' pioneering work in the fields of semiconductors, electronic circuitry, and network infrastructure, CommScope assigned the following patents and patent application to DIFF Scale Operation Research: U.S. Patents and Application Nos. 5,986,486; 6,008,734; 6,157,646; 6,216,166; 6,233,221; 6,363,073; 6,407,983; 6,433,988; 6,664,827; 6,721,328; 6,757,247; 6,847,609; 6,859,430; 6,940,810; 6,959,006; 6,980,565; 6,990,110; 7,106758; 7,170,894; 7,239,627; 7,881,413; 8,121,455; US20010000071A1; US20020150108A1; US20020163886A1; US20020176411A1; US20020180498A1; US20020190764A1; US20030063625A1; US20030118033A1; US20070019686A1; US20100061686A1; US20100150515A1 and International Patents and Application Nos. AT519138T; AU199914551A; AU199923274A; AU199923353A; AU200134402A; AU2002309562A1; CA2442738A1; CA2447983A1; CA2447983C; CN1278969A; CN1289489A; CN1291414A; DE102007010863A1; DE102007010863B4; DE102007032186A1; DE202007008151U1; DK2132589T3; EP1031185A1; EP1050125A1; EP1057361A1; EP1386450A2; EP1386450A4; EP2132589A1; EP2132589B1; ES2368361T3;

[25] *See, e.g.*, U.S. Patent Nos. 7,733,588; 7,737,793; and 7,944,313.

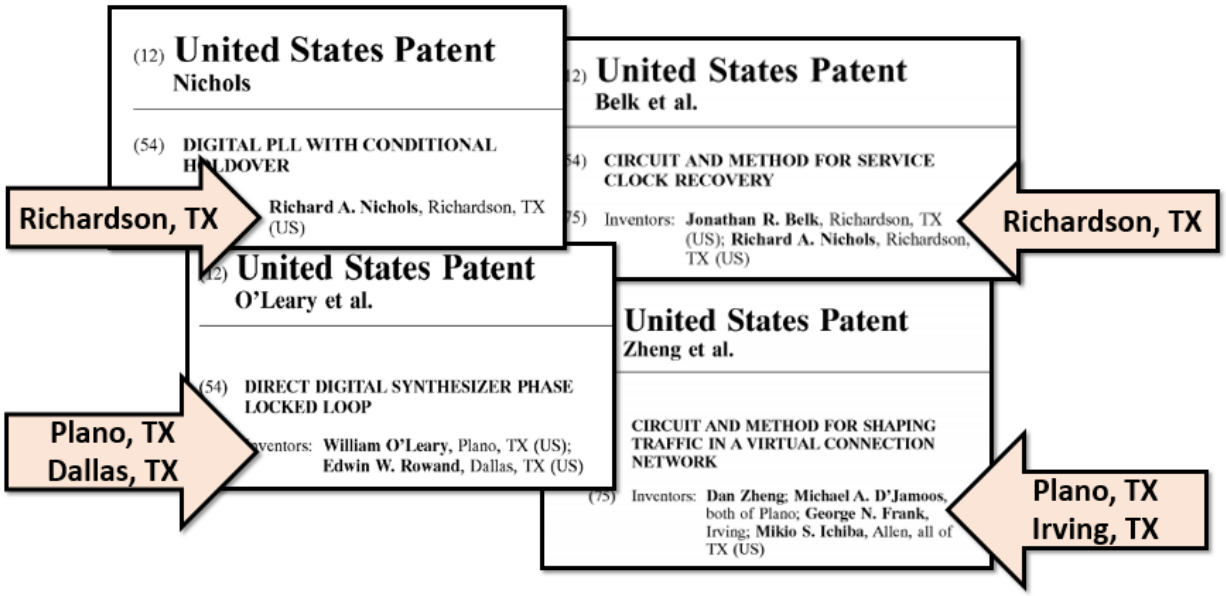
JP03811007B2; JP2001523059A; JP2002502146A; JP2002504793A; JP3811007B2; WO1999025066A1; WO1999038285A1; WO1999043184A1; WO2001037468A2; WO2001037468A3; WO2002084927A2; WO2002084927A3; WO2002101959A1; WO2008104282A1; WO2008104284A1.[26]

15. DIFF Scale Operation Research pursues the reasonable royalties owed for Cisco's use of ADC Telecommunications' and CommScope's groundbreaking technology both here in the United States and throughout the world.

16. CommScope maintains 79,950 square feet of office space at 2601 Telecom Pkwy, Richardson, Texas. Over 200 CommScope employees are employed at its Richardson, Texas location. CommScope maintains off-site document storage at its Richardson, Texas office where hard-copy documents are stored, at least some of which are relevant to this case. CommScope also maintains a datacenter located in Richardson, Texas, where at least some information and software relating to the patents-in-suit in this action are stored. In addition, CommScope maintains a Wide Band Multimode Fiber testing facility in Richardson, Texas.

17. ADC Telecommunications had a significant presence in Richardson, Texas and many of the inventions disclosed in the ADC Telecommunications patent portfolio were made at its Richardson location. On information and belief, many of the named inventors of the ADC Telecommunications patent portfolio continue to be located in and in close proximity to the Eastern District of Texas.

[26] The patents were assigned to DIFF Scale Operation Research by CommScope DSL Systems, LLC and CommScope Technologies, LLC.



U.S. PATENT NOS. 7,881,413; 6,664,827; 7,106,758; 6,407,983 (annotations added) (showing the named inventors located in and in close proximity to the Eastern District of Texas).

CISCO SYSTEMS, INC.

18. On information and belief, Cisco Systems, Inc. ("Cisco"), is a California corporation with its principal place of business at 170 West Tasman Drive, San Jose, California 95134. Cisco may be served through its registered agent Prentice Hall Corporation System, 211 E. 7th Street, Suite 620, Austin, Texas 78701. On information and belief, Cisco is registered to do business in the State of Texas and has been since at least December 29, 1989.

19. On information and belief, Cisco conducts business operations within the Eastern District of Texas in its facilities at 2400 E. President George Bush Highway, Richardson, Texas 75082.

20. On information and belief, Cisco has offices in the Eastern District of Texas where it sells, develops, and/or markets its products including sales offices in Richardson, Texas.

21. On information and belief, Cisco has partnered with several Eastern District of Texas-based businesses to sell and service Cisco products, including, for example: World Wide Technology, Inc.; ConvergeOne, Inc.; My OnCall Tech, LP; Pegasus Technology Solutions, LLC;

and CompuCom Systems Inc.

JURISDICTION AND VENUE

22. This action arises under the patent laws of the United States, Title 35 of the United States Code. Accordingly, this Court has exclusive subject matter jurisdiction over this action under 28 U.S.C. §§ 1331 and 1338(a).

23. Upon information and belief, this Court has personal jurisdiction over Cisco in this action because Cisco has committed acts within the Eastern District of Texas giving rise to this action and has established minimum contacts with this forum such that the exercise of jurisdiction over Cisco would not offend traditional notions of fair play and substantial justice. Defendant Cisco, directly and/or through subsidiaries or intermediaries (including distributors, retailers, and others), has committed and continues to commit acts of infringement in this District by, among other things, offering to sell and selling products and/or services that infringe the patents-in-suit. Moreover, Cisco is registered to do business in the State of Texas, has offices and facilities in the State of Texas, and actively directs its activities to customers located in the State of Texas.

24. Venue is proper in this district under 28 U.S.C. §§ 1391(b)-(d) and 1400(b). Defendant Cisco is registered to do business in the State of Texas, has offices in the State of Texas, and upon information and belief, has transacted business in the Eastern District of Texas and has committed acts of direct and indirect infringement in the Eastern District of Texas.

ADC TELECOMMUNICATIONS LANDMARK SEMICONDUCTOR AND NETWORKING TECHNOLOGIES

25. In 1935, ADC Telecommunications, then known as the Audio Development Company was founded in Minneapolis, Minnesota by two Bell Laboratory engineers to create custom transformers and amplifiers for the radio broadcast industry. In 1941, while participating

in a project to develop a sophisticated audio system for Coffman Union at the University of Minnesota, ADC Telecommunications began to produce jacks, plugs, patch cords, and jack fields, which would be cornerstones for ADC Telecommunications' later entry into telecommunications equipment.[27]

The Billboard

High-Fidelity Audio Devices Boost Capitol Diskery Sales

WASHINGTON, July 29. — High fidelity listening equipment to spur disk sales and please the customers is fast becoming a byword in retail diskeries here, with considerable credit for the trend going to a local firm, the Shrader Manufacturing Company, which specializes in high-fidelity installations. The Shrader company is doing a land-office business not only in store installations but in even greater volume in high fidelity custom sets for homes, a two-way course of operation which, as one enthusiastic dealer has commented, "has been literally filling the Washington air with good music and filling the record shops with good customers."

With customers showing more and more discrimination in choosing recordings ever since the battle of the disk speeds, disk dealers figure that by using high-fidelity equipment in their listening booths they are satisfying a natural trade need. They point out that results of high-fidelity gear are being shown not only in volume of improved high-fidelity recordings.

Among numerous retail diskeries here equipped by Shrader with high-fidelity gear are the Super Music Company, which has three outlets in the city; the Disc Shop, the Hollywood Music Shop and the John Learmont record and book store. The Super Music Company group and the Disc Shop have recently undergone expansion (*The Billboard*, July 22) and are completely rigged with high-fidelity equipment. The Disc Shop alone has half a dozen listening booths, each equipped with individual high-fidelity amplifiers and speakers. The Super Music group has a total of nearly 70 disk listening posts rigged to high-fidelity equipment. Particularly popular with dealers who have installed high-fidelity gear are the Livingston tone arm, the Rek-O-Kut heavy transcription turntable, Audio Development Company (ADC) amplifiers and Altec 15-inch speakers.

High-fidelity gear is considered by

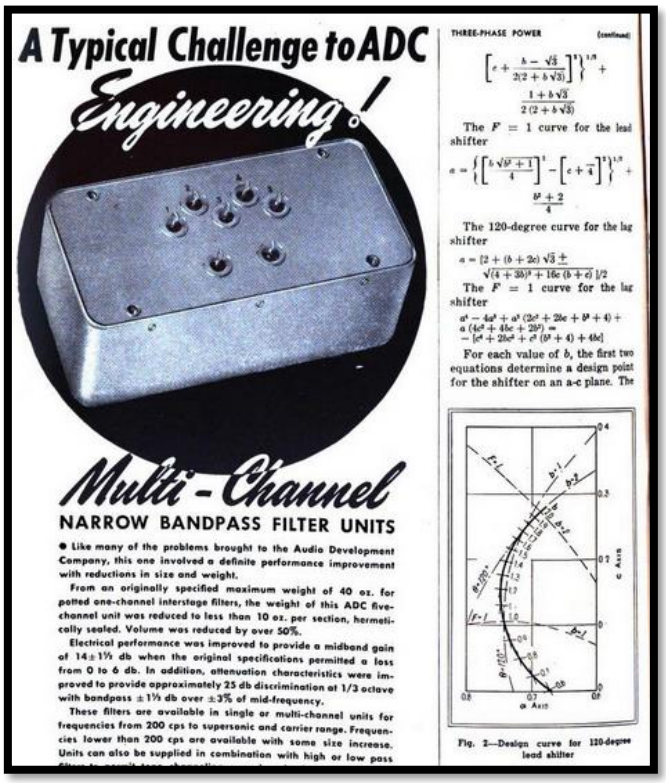
(See High-Fidelity Audio, page 38)

High Fidelity Audio Devices Boost Capitol Diskery Sales, BILLBOARD MAGAZINE at 12 (August 8, 1950) (describing Audio Development Company's amplifiers).

26. In 1961, ADC Telecommunications released the Bantam jack. This product was an amalgam of miniaturized components and became standard for telephone circuit access and patching.[28]

[27] James F. Mauk, INDUSTRIAL RESEARCH LABORATORIES OF THE UNITED STATES at 47 (1947) (listing the research activities of the Audio Development Company as "high temperature electronic transformers; miniaturization of electronic transformers; high frequency electrical wave filters, encapsulation techniques; epoxies").

[28] Steven Titch, *ADC Unveils Loop Product Strategy*, TELEPHONY at 9 (February 24, 1992).



A Typical Challenge to ADC Engineering!

Multi-Channel

NARROW BANDPASS FILTER UNITS

● Like many of the problems brought to the Audio Development Company, this one involved a definite performance improvement with reductions in size and weight.

From an originally specified maximum weight of 40 oz. for potted one-channel interstage filters, the weight of this ADC five-channel unit was reduced to less than 10 oz. per section, hermetically sealed. Volume was reduced by over 50%.

Electrical performance was improved to provide a midband gain of 14 ± 1½ db when the original specifications permitted a loss from 0 to 6 db. In addition, attenuation characteristics were improved to provide approximately 25 db discrimination at 1/3 octave with bandpass ±1½ db over ±3% of mid-frequency.

These filters are available in single or multi-channel units for frequencies from 200 cps to supersonic and carrier range. Frequencies lower than 200 cps are available with some size increase. Units can also be supplied in combination with high or low pass

THREE-PHASE POWER (continued)

The $F = 1$ curve for the lead shifter

The 120-degree curve for the lag shifter

The $F = 1$ curve for the lag shifter

For each value of b, the first two equations determine a design point for the shifter on an a-c plane. The

Fig. 2—Design curve for 120-degree lead shifter

A Typical Challenge To ADC Engineering, ELECTRONICS MAGAZINE Vol. 18 at 288 (August 1945) (describing one of the early innovations of ADC Telecommunications).

27. In the 1960s, ADC Telecommunications began an ongoing partnership with NASA's space missions, designing and manufacturing sensors for the Columbia space shuttle.

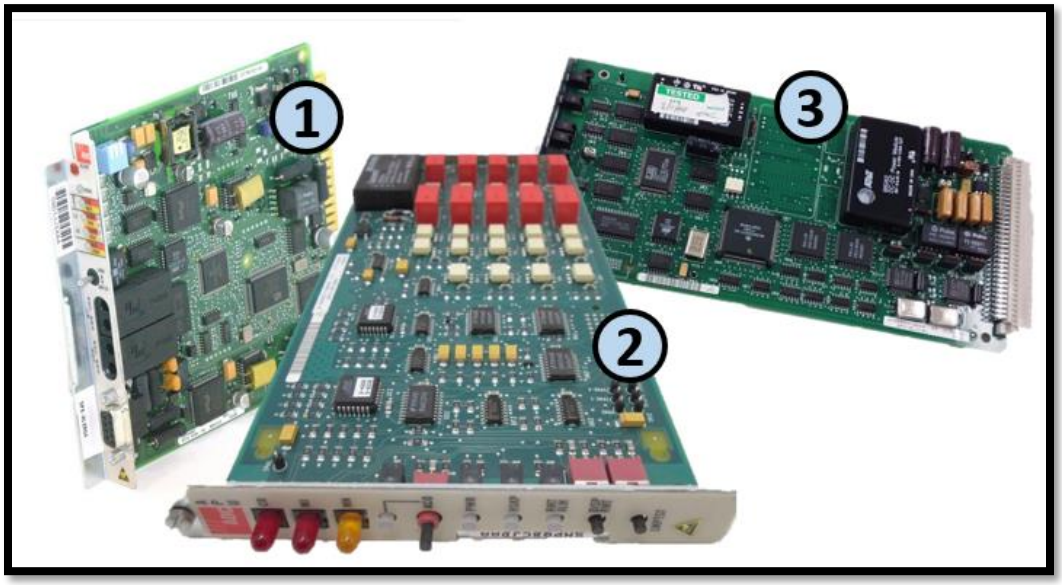
power supply board. The transceivers used are the CAF model manufactured by ADC Telecommunications, Inc.. The transceiver use bidirectional, full-duplex signal transmission over a single optic fiber. The transceiver is a self-contained, circuit-board-mountable device that contains the transmitting LED, the receiving photodetector, and the beam splitter. The transceivers are a matched pair which utilize two different light frequencies for receiving and transmitting. This configuration allows for full-duplex and bidirectional operation over a single fiber optic line. The optic fiber connects to the transceivers with SMA-type connectors.

R. L. Glassell et al., *Custom Electronic Subsystems For The Laboratory Telerobotic Manipulator*, PROCEEDINGS OF THE FOURTH ANS TOPICAL MEETING ON ROBOTICS AND REMOTE SYSTEMS at 151 (1991) (describing the work ADC Telecommunications was doing for NASA).

28. The 1970s and 1980s ushered in technological advancement in all areas of telecommunications and data processing. Public and private computer use increased, and

telecommunications evolved into the computer age, with telephonic digital transmission and the expansion of data communications. As a leading innovator in these fields, ADC Telecommunications grew dramatically. ADC Telecommunications entered the video services delivery market and was a leading supplier of fiber-optic video transmission equipment for cable operators.[29]

29. In the 1990's ADC Telecommunications utilized its fiber-optics expertise to develop a local loop system with the goal of providing economical fiber directly to private homes. ADC Telecommunications also created Networx, a novel transmission platform that integrated cable management and private networking products, using synchronous optical network and the asynchronous transfer mode (ATM). The cornerstone of Networx was Sonoplex, a multi-rate, multimedia system that brought fiber to the customer's work or residence site, while making use of existing copper lines.



ANNOTATED GRAPHIC OF SELECTED ADC SONOPLEX TELECOMMUNICATIONS PRODUCTS (numbered annotations showing: (1) SPX-HLXRG4 Sonoplex HDSL Module; (2) ADC SPX-APU0B1 SONEPLEX ALM Processor Module; and (3) ADC SPX-RLX1B1 CARD.).

[29] Carol Wilson, *ADC Launches Fiber-Coax Platform*, TELEPHONY AT 11 (May 24, 1993).

30. In the 1990s, ADC Telecommunications partnered with South Central Bell, Mississippi Educational Television, Northern Telecom, IBM, and Apple Computer to create Fibernet, a network linking students at four high schools in Clarksville, Corinth, West Point, and Philadelphia, Mississippi, with teachers at Mississippi State University, Mississippi University for Women, and Mississippi School for Mathematics and Science to create "electronic classrooms."

31. ADC Telecommunications became an "early leader" in the asynchronous transfer mode (ATM) market, developing some of the first ATM switches. The ADC Telecommunications ATM switch enabled the handling the massive flows of simultaneous high-speed digital information that the industry projected would be generated during the latter half of the 1990s and into the 21st century, arising from the blending of the communications, computing, and entertainment industries. ADC Telecommunications also landed a coup in March 1994 when Ameritech chose ADC to supply equipment for its fiber-optic video system. This $4.4 billion project would bring 70 channels of analog television and 40 channels of digital video to customers, with unlimited program choices and interactive, customer-controllable programming. By 1999, ADC Telecommunications employed 9,700 people and was selling $1.5 billion dollars in communications equipment.

THE ASSERTED PATENTS

U.S. PATENT NO. 7,881,413

32. U.S. Patent No. 7,881,413 (the "'413 patent") entitled, *Digital PLL With Conditional Holdover*, was filed on March 1, 2002, and claims priority to March 2, 2001. The '413 patent is subject to a 35 U.S.C. § 154(b) term extension of 2,127 days. DIFF Scale Operation Research is the owner by assignment of the '413 patent. A true and correct copy of the '411 patent is attached hereto as Exhibit A.

33. The ‘413 patent teaches novel phase locked loops (PLL) that provide for conditional holdover that is especially suited for use in communications networks.

34. The ‘413 patent and its underlying patent application have been cited by 24 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘413 patent and its underlying patent application as relevant prior art:

- Fujitsu Ltd.
- Infineon Technologies Ag
- Mediatek Inc.
- Schweitzer Engineering Laboratories, Inc.
- Silicon Laboratories Inc
- Sony Corporation
- Thomas & Betts International, LLC
- National Semiconductor Corporation
- L3 Communications Integrated Systems, L.P.
- Xilinx, Inc.
- Nortel Networks Limited
- Lattice Semiconductor
- Emerson Electric Co., Ltd.
- Furuno Electric Co., Ltd.
- Panasonic Corporation
- Huawei Technologies Co., Ltd

U.S. PATENT NO. 6,664,827

35. U.S. Patent No. 6,664,827 (the “‘827 patent”) entitled, *Direct Digital Synthesizer Phase Locked Loop,* was filed on March 1, 2002, and claims priority to March 2, 2001. DIFF Scale Operation Research is the owner by assignment of the ‘827 patent. A true and correct copy of the ‘827 patent is attached hereto as Exhibit B.

36. The ‘827 patent discloses phase locked loops for establishing a timing signal for signal communication synchronization. The various embodiments of the invention make use of phase locked loops adapted to filter and store data indicative of the control signal applied to an oscillator. Such phase locked loops permit suppression of tracking in the event of a step change

in the phase difference between the reference clock signal and the feedback signal in the phase locked loop. Such phase locked loops further facilitate compensation for drift of the oscillator.

37. The ‘827 patent teaches, in one embodiment, a phase locked loop that includes a digital phase comparator having a first input for receiving a reference clock signal, a second input for receiving a feedback signal, and an output for providing an error signal; a digital loop filter having an input for receiving the error signal and an output for providing a control signal; a numerically-controlled oscillator having an input for receiving the control signal and an output for providing a timing signal, wherein the feedback signal is derived from the timing signal.

38. The ‘827 patent teaches detecting a step change in a phase relationship between the reference clock signal and the feedback signal, and to recenter the digital phase comparator if a step change is detected.

39. The ‘827 patent teaches the sampling of data from a low-pass filter indicative of an average control signal and comparing the average control signal to a threshold limit. The ‘827 patent describes trimming the oscillator if the average control signal is outside the threshold limit.

40. The ‘827 patent further teaches monitoring a phase comparator for a step change in the phase difference between the reference clock signal and the feedback signal; and recentering the phase comparator if a step change in the phase difference between the reference clock signal and the feedback signal is detected.

41. The ‘827 patent and its underlying patent application have been cited by 48 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘827 patent and its underlying patent application as relevant prior art:

- Advantest Corporation
- Agilent Technologies Inc.,

- Air Products and Chemicals, Inc.
- Broadcom Corporation
- Datang Group
- Freescale Semiconductor, Inc.
- NXP Semiconductors
- Infineon Technologies AG
- International Business Machines Corporation
- Marvell International Ltd.
- Cavium
- Metrotech Corporation
- Nvidia Corporation
- Siemens Aktiengesellschaft
- Standard Microsystems Corporation
- Western Digital Technologies, Inc.
- Hewlett-Packard Development Company, L.P.
- Rambus, Inc.
- Panasonic Corporation
- National Semiconductor Corporation
- Alcatel
- Lightlab Imaging, Inc.
- Matsushita Electric Industrial Co., Ltd.
- National Aeronautics and Space Administration ("NASA")
- Advanced Micro Devices, Inc.
- Nihon Dempa Kogyo Co., Ltd.

U.S. PATENT NO. 7,106,758

42. U.S. Patent No. 7,106,758 (the "'758 patent") entitled, *Circuit and Method for Service Clock Recovery*, was filed on August 3, 2001. The '758 patent is subject to a 35 U.S.C. § 154(b) term extension of 885 days. DIFF Scale Operation Research is the owner by assignment of the '758 patent. A true and correct copy of the '758 patent is attached hereto as Exhibit C.

43. The '758 patent teaches synchronizing a service clock at a destination node with a service clock at a source node.

44. The '758 patent discloses the use of control values to set a service clock frequency at a computer node that is receiving data over a network.

45. The ‘758 patent teaches clock synchronization for a circuit emulation service over a packet network wherein data packets are received from a source node at one or more ports of a computer system.

46. The ‘758 patent discloses improvements in techniques for recovering a service clock at a destination node.

47. The clock synchronization technologies described in the ‘758 patent include the use of an adaptive clock recovery technique to recover the service clock. Further, the ‘758 patent claims the use of a service clock that is controlled based on values calculated over a plurality of time periods.

48. The ‘758 patent describes the use of a microcontroller that uses information from a counting circuit to control a direct digital synthesis circuit (“DDS”). The DDS is used to generate a local service clock signal for a destination node.

49. Further, the ‘758 patent teaches the use of a microcontroller that utilizes the fill level of a buffer to control the frequency of the local service clock generated by the DDS circuit.

50. The ‘758 patent family has been cited by 46 United States patents and patent applications as relevant prior art. Specifically, patents and patent applications issued to the following companies have cited the ‘758 patent family as relevant prior art:

- Intel Corporation
- Broadcom Corporation
- Fujitsu, Ltd.
- Huawei Technologies Co., Ltd.
- Juniper Networks, Inc.
- LSI Corporation
- National Semiconductor Corporation
- Texas Instruments, Inc.
- Nortel Networks, Ltd.
- Siverge, Ltd.
- Symmetricom, Inc.
- Microsemi Corporation
- Tellabs Operations, Inc.
- Via Technologies, Inc.

- Wideband Semiconductors, Inc.
- Acorn Packet Solutions, LLC
- Adc Telecommunications, Inc.
- Axerra Networks, Ltd.
- British Telecommunications PLC
- INOVA Semiconductors GmbH

U.S. PATENT NO. 6,407,983

51. U.S. Patent No. 6,407,983 (the "'983 patent") entitled, *Circuit and Method for Shaping Traffic in a Virtual Connection Network*, was filed on February 20, 1998. DIFF Scale Operation Research is the owner of all right, title, and interest in the '983 patent. A true and correct copy of the '983 patent is attached hereto as Exhibit D.

52. The '983 patent claims specific methods and systems for delivering data packets from a traffic source to a virtual connection at a uniform rate using a traffic shaper. For example, one or more of the '983 patent claims describe a system where a buffer receives packets from a traffic source (e.g., a server on a computer network that originates data packets). The claimed system utilizes a counter that indicates the beginning of each of a number of timeslots over a selectable time period. Further, the claimed system contains a request generator that creates request signals that request timeslots for transmitting data out of a buffer. The requests are distributed so that a desired data rate for the traffic source is established.

53. The '983 patent teaches a method and system for an improved traffic shaper. At the time the inventions disclosed in the '983 patent were conceived "conventional[] telecommunications services [had] been provided to subscribers using dedicated channels." '983 patent, col. 1:11-12.

54. In the late 1990's, conventional traffic shaping technology could not selectively allocate timeslots for data transmission in a measurement window. The '983 patent teaches specific solutions to the problem apparent in the technology at the time. For example, the '983

patent teaches the use of a request generator that generates requests during a specific time window. The request generator attempts to evenly distribute the requests over the duration of the window.

55. The ‘983 patent discloses additional improvements to the functioning of traffic shapers by teaching the delivery of data packets from at least one traffic source to a virtual connection network at a substantially uniform rate.

56. The ‘983 patent further teaches the use of generating requests for timeslots for data transmission according to a stored pattern based on a selected data rate.

57. Another insight for improving the performance of traffic shaping systems described by the ‘983 patent is to use a counter which can generate pulses that indicate the beginning of each timeslot in a measurement window.

58. The inventions taught in the ‘983 patent achieve improvements in traffic shaping systems by creating request signals that request timeslots for transmitting data out of the buffer. Implementation of the system and methods disclosed in the ‘983 patent is directed to a specific improvement in computer technology - delivering data packets from at least one traffic source at a substantially uniform rate. Further, the claims of the ‘983 patent are directed to specific asserted improvements in computer capabilities. For example, the claims recite specific steps – a counter that indicates the beginning of each of a number of time slots over a selectable time period – that accomplish the desired result – delivering data packets at a substantially uniform rate.

59. The ‘983 patent claims a technical solution to a problem unique to computer systems: delivering data packets to a virtual connection.

60. The ‘983 patent family has been cited by 61 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘983 patent family as relevant prior art:

- Alcatel-Lucent S.A.
- AT&T, Inc.
- Broadcom Corporation
- End II End Communications, Inc.
- Intel Corporation
- InterDigital, Inc.
- International Business Machines Corporation
- ORBCOMM, Inc.
- PRO DESIGN Electronics GmbH
- Riverstone Networks, Inc.
- Verizon Communications, Inc.

U.S. PATENT NO. 6,847,609

61. U.S. Patent No. 6,847,609 ("the '609 patent") entitled, *Shared Management of Network Entity*, was filed on August 18, 1999, and claims priority to June 29, 1999. DIFF Scale Operation Research is the owner of all right, title, and interest in the '609 patent. A true and correct copy of the '609 patent is attached hereto as Exhibit E.

62. The '609 patent claims specific methods and systems for improved management of network entities at the point of demarcation that allows the service provider and enterprise flexibility in creating enterprise networks. The systems and methods claimed by the '609 patent include a network entity that is configurable to be jointly managed by at least two network management stations, *e.g.*, a network management station controlled by the enterprise and a network management station controlled by a service provider. Advantageously, this provides greater flexibility to service providers and enterprises in implementing an enterprise network.

63. The '609 patent teaches a method and system where a number of local area networks are each coupleable to at least one network element of a service provider network.

64. The '609 patent further teaches the use of a service delivery unit that allows management functions for a network to be divided or shared by the service provider and the enterprise network.

65. Another insight for improving the performance of enterprise networks described by the '609 patent is to have a network management terminal communicatively coupled to one network element of the service provider network such that the network management terminal is operable to view a configurable portion of data stored in memory.

66. Further, the '609 patent improves the performance of an enterprise network by facilitating management of selected aspects of a network element.

67. The '609 patent further discloses monitoring operation of a telecommunications network at a network entity.

68. Among the inventions disclosed in the '609 patent is bifurcating management of a network by having a network management station of an enterprise network view a first, configurable portion of the management data.

69. The inventions taught in the '609 patent achieve improvements in enterprise networks by having a network entity that is configurable to be jointly managed by at least two network management stations, e.g., a network management station controlled by the enterprise and a network management station controlled by a service provider. This provides greater flexibility to service providers and enterprises in implementing an enterprise network. Implementation of the system and methods disclosed in the '609 patent are directed to a specific improvement in computer technology – enterprise networks. Further, the claims of the '609 patent are directed to specific improvements in computer capabilities. For example, the claims recite specific steps – a network management terminal communicatively coupled to the at least one network element of the service provider network – that accomplish the desired result.

70. The '609 patent claims a technical solution to a problem unique to computer systems: improved management of network entities at the point of demarcation.

71. The ‘609 patent and its related patents have been cited by 61 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘609 patent family as relevant prior art:

- Aerohive Networks, Inc.
- Alcatel-Lucent S.A.
- Allied Telesis K.K.
- AT&T, Inc.
- Avaya, Inc.
- Ciena Corporation
- ***Cisco Systems, Inc.***
- International Business Machines Corporation
- Microsoft Corporation
- Narad Networks, Inc.
- Packeteer, Inc.
- SBCX Properties, L.P.
- Sun Microsystems, Inc.
- Telecom Italia S.p.A.

U.S. PATENT NO. 6,940,810

72. U.S. Patent No. 6,940,810 (“the ‘810 patent”) entitled, *Protection Switching of Virtual Connections at the Data Link Layer*, was filed on October 25, 2000, and claims priority to February 20, 1998. The ‘810 patent is subject to a 35 U.S.C. § 154(b) term extension of 875 days. DIFF Scale Operation Research is the owner of all right, title, and interest in the ‘810 patent. A true and correct copy of the ‘810 patent is attached hereto as Exhibit F.

73. The ‘810 patent claims specific methods and systems for protection switching in a network that uses virtual connections. The system includes first and second switch fabrics, unidirectional busses that provide a communication path between the first and second switch fabrics, and network elements that separately track the status of a number of virtual connections such that when an error is detected by one of the switch fabrics, the error is communicated to the other switch fabric.

74. The ‘810 patent teaches a method and system wherein the first and second switch fabrics of each network element are associated with a route.

75. The ‘810 patent further teaches the use of a first and second uni-directional bus that is used to communicate the change in state for a virtual connection.

76. Another insight for improving the performance of a network described by the ‘810 patent is to have a number of ring segments coupled between adjacent network elements to form first and second routes for transporting cells using virtual connections.

77. The ‘810 patent further discloses at least two uni-directional busses coupled between two switch fabrics.

78. Among the inventions disclosed in the ‘810 patent is a ring network that includes two routes for transporting cells using a virtual connection. Further, for each virtual connection, one route is the working route and the other route is the protection route.

79. The inventions taught in the ‘810 patent achieve improvements in computer network systems by using virtual connections to communicate between two switch fabrics. Implementation of the system and methods disclosed in the ‘810 patent is directed to a specific improvement in computer technology – protection switching in a network that uses virtual connections. Further, the claims of the ‘810 patent are directed to specific asserted improvements in computer networking capabilities. For example, the claims recite specific steps – first and second unidirectional busses that provide a communication path between the first and second switch fabrics – that accomplish the desired result.

80. The ‘810 patent claims a technical solution to a problem unique to computer systems: network survivability following errors.

81. The ‘810 patent and its related patents have been cited by 17 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘810 patent family as relevant prior art:

- Brocade Communications Systems, Inc. (now part of Broadcom Limited)
- Foundry Networks LLC (now part of Broadcom Limited)
- Ciena Corporation
- Audiocodes Texas, Inc.
- Hewlett-Packard Development Company, L.P.
- Positron Networks PNI, Inc.
- Samsung Electronics Co., Ltd.
- Symantec Corporation
- Tekelec, Inc. (now part of Oracle Corporation)
- Telefonaktiebolaget LM Ericsson
- Broadcom Limited

U.S. PATENT NO. 6,990,110

82. U.S. Patent No. 6,990,110 (“the ‘110 patent”) entitled, *Automatic Permanent Virtual Circuit Connection Activation For Connection Oriented Networks*, was filed on April 12, 2001. The ‘110 patent is subject to a 35 U.S.C. § 154(b) term extension of 530 days. DIFF Scale Operation Research is the owner of all right, title, and interest in the ‘110 patent. A true and correct copy of the ‘110 patent is attached hereto as Exhibit G.

83. The ‘110 patent claims specific methods and systems for improvements in end-to-end provisioning of communication systems. The system includes an access network, a central unit, and customer premises equipment. Further, the ‘110 patent describes a system wherein an automatic permanent virtual circuit connection is embedded within the central unit. The automatic permanent virtual circuit is enabled when the customer premises equipment is initialized and can create a translation connection between the customer premises equipment and the central unit.

84. The ‘110 patent teaches a method and system for automatic permanent virtual circuit connection activation.

85. The ‘110 patent further teaches the use of a central unit selectively coupled to the access network.

86. Another insight for improving the performance of a communications network described by the ‘110 patent is to have an automatic permanent virtual circuit connection activation function embedded in the central unit. And, when the customer premises equipment is initialized, a translation connection between the customer premises equipment and the central unit is created.

87. The ‘110 patent further discloses a central unit that recognizes at least one virtual circuit identifier of the customer premises equipment by receiving traffic from the customer premises equipment.

88. Among the inventions disclosed in the ‘110 patent is a system for automatically configuring a permanent virtual circuit in an asynchronous transfer mode network

89. The inventions taught in the ‘110 patent achieve improvements in end-to-end provisioning of communication networks by creating a translation connection between the customer premises equipment and the central unit. Implementation of the system and methods disclosed in the ‘110 patent is directed to a specific improvement in computer technology - end-to-end provisioning of communication systems. Further, the claims of the ‘110 patent are directed to specific asserted improvements in computer capabilities. For example, the claims recite specific steps – detecting initiation of communication at a user network interface between a first and a second network element and creating a translation connection between the first and second network elements – that accomplish the desired result.

90. The ‘110 patent claims a technical solution to a problem unique to computer systems: end-to-end provisioning of communication systems.

91. The ‘110 patent and its related patents have been cited by 34 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘110 patent family as relevant prior art:

- Alcatel-Lucent S.A.
- AT&T, Inc.
- BellSouth Intellectual Property Corporation
- Brooktree Broadband Holding, Inc. (now part of Synaptics, Inc.)
- ***Cisco Systems, Inc.***
- Fujitsu, Ltd.
- Huawei Technologies Co., Ltd.
- Intel Corporation
- Nant Holdings IP, LLC
- NEC Corporation
- SBC Properties, L.P.
- Tellabs, Inc.
- Wireless LAN Systems Oy

U.S. PATENT NO. 6,721,328

92. U.S. Patent No. 6,721,328 (“the ‘328 patent”) entitled, *Adaptive Clock Recovery for Circuit Emulation Service*, was filed on November 19, 1999. DIFF Scale Operation Research is the owner of all right, title, and interest in the ‘328 patent. A true and correct copy of the ‘328 patent is attached hereto as Exhibit H.

93. The ‘328 patent claims specific methods and systems for clock recovery in a packet network. The system includes a network which receives data packets at a destination node. Further, the data packets are stored in a buffer and read out of the buffer using a locally generated clock. The fill level of the buffer is monitored over a first period. A relative maximum fill level for the buffer is identified during the first period of time. Further, the relative maximum fill level is used to control the frequency of the locally generated clock so as to control the rate at which data is read out of the buffer.

94. The ‘328 patent teaches a method and system for adaptive clock recovery.

95. The ‘328 patent further teaches the use of a peak buffer fill level as an indicator to lock a local clock at a destination node with the service clock at a source node.

96. Another insight for improving the performance of clock recovery in a packet network described by the ‘328 patent is using the relative maximum fill level to control a frequency of the locally generated clock so as to control the rate at which data is read out of the buffer.

97. Among the inventions disclosed in the ‘328 patent is a system comprising a peak fill detector that compares a read address and a write address for the buffer and stores the maximum buffer fill level observed over a period of time.

98. The inventions taught in the ‘328 patent achieve improvements in clock recovery systems by using adaptive clock recovery using a buffer. Implementation of the system and methods disclosed in the ‘328 patent are directed to a specific improvement in computer technology – clock recovery. Further, the claims of the ‘328 patent are directed to specific asserted improvements in computer capabilities. For example, the claims recite specific steps – controlling the frequency of a recovered clock signal based on the relative maximum fill level – that accomplish the desired result.

99. The ‘328 patent claims a technical solution to a problem unique to computer systems: clock recovery in a packet network.

100. The ‘328 patent and its related patents have been cited by 35 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘328 patent family as relevant prior art:

- Axerra Networks, Inc.
- Broadcom Corporation
- ***Cisco Systems, Inc.***
- ENENSYS Technologies SA
- Gennum Corporation (now part of Semtech Corporation)
- Hewlett-Packard Development Company, L.P.

- Infineon Technologies AG
- Lantiq Deutschland GmbH (now part of Intel Corporation)
- Lycium Networks (B.V.I.) Ltd.
- Network Equipment Technologies, Inc. (now part of Ribbon Communications, Inc.)
- RAD Data Communications Ltd.
- Rohde & Schwarz GmbH & Co. KG
- Siverge Networks, Ltd.
- Sony Corporation
- Yamaha Corporation
- Zarlink Semiconductor Limited (now part of Microsemi Corporation)
- Semtech Corporation
- Microsemi Corporation

U.S. PATENT NO. 6,216,166

101. U.S. Patent No. 6,216,166 ("the '166 patent") entitled, *Shared Media Communications in a Virtual Connection Network,* was filed on February 20, 1998. DIFF Scale Operation Research is the owner of all right, title, and interest in the '166 patent. A true and correct copy of the '166 patent is attached hereto as Exhibit I.

102. The '166 patent claims specific methods and systems for efficient shared media communications in a virtual connection network. The system includes network elements including elements providing for switching and transport and a policing network element that contains functionality for terminating a local area network group of data that has a corrupted media access address.

103. The '166 patent teaches a method and system for shared media communications in a virtual connection network.

104. The '166 patent further teaches the assigning of media access control (MAC) addresses to network elements.

105. Another insight for improving the performance of a computer network described by the '166 patent is to have a unique (MAC) address assigned to each network element.

106. The ‘166 patent further discloses a policing network element that terminates any local area network type groups of data that have corrupted source or destination MAC addresses.

107. Among the inventions disclosed in the ‘166 patent is a system for a virtual connection dedicated to transmitting packets including management data to the network elements based on the MAC addresses of each of the network elements.

108. The inventions taught in the ‘166 patent achieve improvements in virtual connection networks by policing network elements and terminating network elements with corrupted source or destination MAC addresses. Implementation of the system and methods disclosed in the ‘166 patent are directed to a specific improvement in computer technology – policing network elements with corrupted media access control addresses. Further, the claims of the ‘166 patent are directed to specific asserted improvements in computer capabilities. For example, the claims recite specific steps – assigning each network element a media access control address and terminating network elements with corrupted media access control addresses – that accomplish the desired result.

109. The ‘166 patent claims a technical solution to a problem unique to computer systems: multicasting management data on a virtual connection network.

110. The ‘166 patent and its related patents have been cited by 14 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the ‘166 patent family as relevant prior art:

- Alcatel-Lucent S.A.
- Avaya, Inc.
- Fujitsu, Ltd.
- NEC Corporation
- Nokia Corporation
- Nortel Networks Corporation
- Orbit Communication Systems, Ltd.
- Qwest Communications International, Inc. (now owned by CenturyLink, Inc.)

- Thomson Licensing S.A. (now Technicolor SA)

U.S. PATENT NO. 6,859,430

111. U.S. Patent No. 6,859,430 ("the '430 patent") entitled, *Protection Switching of Virtual Connections*, was filed on October 1, 1999, and claims priority to February 20, 1998. DIFF Scale Operation Research is the owner of all right, title, and interest in the '430 patent. A true and correct copy of the '430 patent is attached hereto as Exhibit J.

112. The '430 patent claims specific methods and systems for the protection of virtual connections in a network.

113. The inventions taught in the '430 patent achieve improvements in networking systems. Implementation of the system and methods disclosed in the '430 patent is directed to a specific improvement in computer technology – virtual connection switching. Further, the claims of the '430 patent are directed to specific asserted improvements in computer capabilities

114. The '430 patent and its related patents have been cited by 16 United States patents and patent applications as relevant prior art. Specifically, patents issued to the following companies have cited the '430 patent family as relevant prior art:

- Adtran, Inc.
- Ciena Corporation
- Hewlett-Packard Development Company, L.P.
- Infinera Corporation
- Mitsubishi Denki Kabushiki Kaisha
- Nortel Networks, Ltd.
- Alcatel-Lucent S.A.

COUNT I
INFRINGEMENT OF U.S. PATENT NO. 7,881,413

115. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

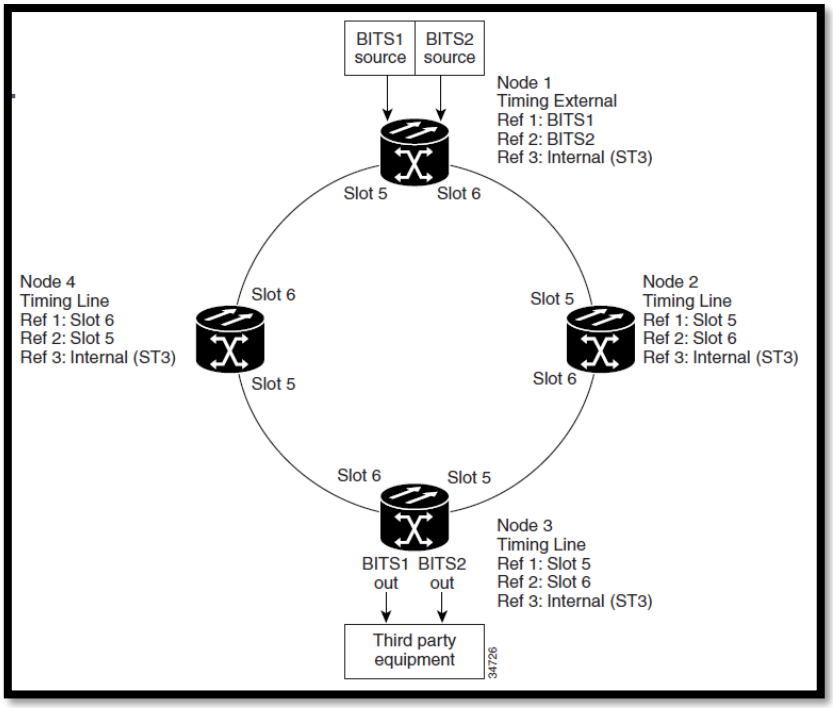
116. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for generating a timing signal in a phase locked loop.

117. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco Optical Networking Products, including: Cisco ONS 15454 and Cisco ONS 15600 (collectively, the "Cisco '413 Product(s)").

118. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '413 Products in regular business operations.

119. On information and belief, one or more of the Cisco '413 Products include technology for generating a timing signal from a reference clock signal.

120. On information and belief, one or more of the Cisco '413 Products contain a phase comparator.



CISCO ONS 1545 ENGINEERING PLANNING GUIDE at 7-86 (November 2009).

121. On information and belief, one or more of the Cisco ‘413 Products contain a low-pass filter.

122. On information and belief, one or more of the Cisco ‘413 Products comprise an oscillator coupled in a feedback arrangement.

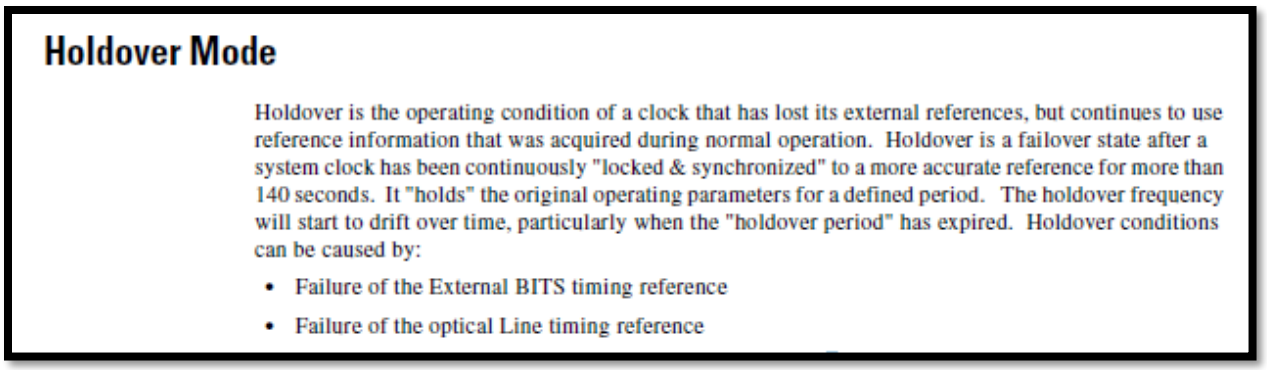
123. On information and belief, one or more of the Cisco ‘413 Products comprise a control system that generates an output signal where the phase of the output signal is related to the phase of an input signal.

124. On information and belief, the Cisco ‘413 Products are available to businesses and individuals throughout the United States.

125. On information and belief, the Cisco ‘413 Products are provided to businesses and individuals located in the Eastern District of Texas.

126. On information and belief, Cisco has directly infringed and continues to directly infringe the ‘413 patent by, among other things, making, using, offering for sale, and/or selling technology for generating a timing signal in a phase locked loop, including but not limited to the Cisco ‘413 Products, which include infringing technology for generating a timing signal in a phase locked loop. Such products and/or services include, by way of example and without limitation, the Cisco ‘413 Products.

127. On information and belief, the Cisco ‘413 Products comprise a system for generating a timing signal from a reference clock signal in a phase locked loop.



Holdover Mode

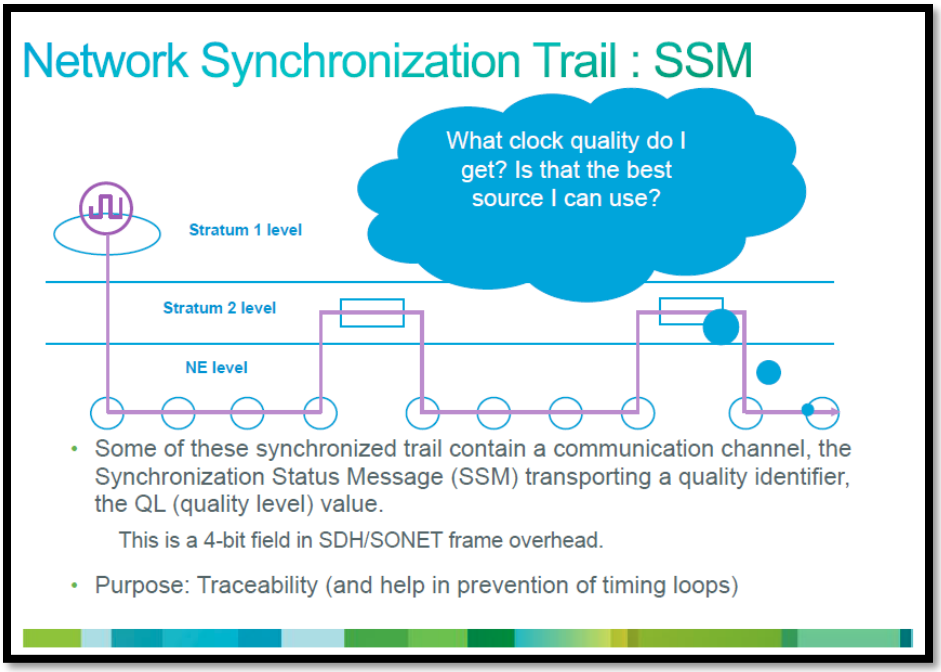
Holdover is the operating condition of a clock that has lost its external references, but continues to use reference information that was acquired during normal operation. Holdover is a failover state after a system clock has been continuously "locked & synchronized" to a more accurate reference for more than 140 seconds. It "holds" the original operating parameters for a defined period. The holdover frequency will start to drift over time, particularly when the "holdover period" has expired. Holdover conditions can be caused by:

- Failure of the External BITS timing reference
- Failure of the optical Line timing reference

CISCO ONS 1545 ENGINEERING PLANNING GUIDE at 7-81 (November 2009).

128. On information and belief, the Cisco '413 Products include functionality for monitoring a status message received from a source of the reference clock signal indicative of a quality level of the reference clock signal.

129. On information and belief, the Cisco '413 Products are a system containing functionality for placing the phase locked loop in a holdover condition if the quality level indicated by the status message is below a target level.



Peter Gaspar, *Frequency and Time Synchronization in Packet Based Networks*, CISCO PRESENTATION at 24 (2010) (Mr. Gaspar was a vertical solutions architect at Cisco).

130. The Cisco '413 Products comprise a system for performing the elements in a proscribed order.

131. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '413 Products, Cisco has injured DIFF Scale Operation Research and is liable to the Plaintiff for directly infringing one or more claims of the '413 patent, including at least claim 21 pursuant to 35 U.S.C. § 271(a).

132. On information and belief, Cisco also indirectly infringes the '413 patent by actively inducing infringement under 35 USC § 271(b).

133. Cisco has had knowledge of the '413 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '413 patent and knew of its infringement, including by way of this lawsuit.

134. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco '413 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '413 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '413 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '413 Products that have the capability of operating in a manner that infringe one or more of the claims of the '413 patent, including at least claim 21, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '413 Products to utilize the products in a manner that directly infringe one or more claims of the '413 patent.[30] By providing instruction and training to customers and end-users on how to use the Cisco '413 Products in a manner that directly infringes one or more claims of the '413 patent, including at least claim 21, Cisco specifically intended to induce infringement of the '413 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '413 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '413 patent. Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '413 patent, knowing that such use constitutes infringement of the '413 patent.

[30] *See, e.g.*, ONS 15454 TIMING ISSUES (Dec. 29, 2004); CISCO ONS 15454 MSPP, ENGINEERING PLANNING GUIDE – RELEASE 4.0 (Aug. 2007); CISCO ONS 15454 ENGINEERING PLANNING GUIDE R5.0 (Nov. 2009); TIMING AND SYNCHRONIZATION ON CISCO ONS 15454 (2014); CISCO ONS 15600 REFERENCE MANUAL, RELEASES 9.1 AND 9.2.1 (Aug. 9, 2012).

135. The ‘413 patent is well-known within the industry as demonstrated by multiple citations to the ‘413 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the ‘413 patent without paying a reasonable royalty. Cisco is infringing the ‘413 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

136. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘413 patent.

137. As a result of Cisco’s infringement of the ‘413 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT II
INFRINGEMENT OF U.S. PATENT NO. 6,664,827

138. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

139. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for timing circuitry.

140. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco Optical Networking Products, including: Cisco ONS 15454 and Cisco ONS 15600 (collectively, the “Cisco ‘827 Product(s)”).

141. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco ’827 Products in regular business operations.

142. On information and belief, one or more of the Cisco ’827 Products include technology for a phase locked loop.

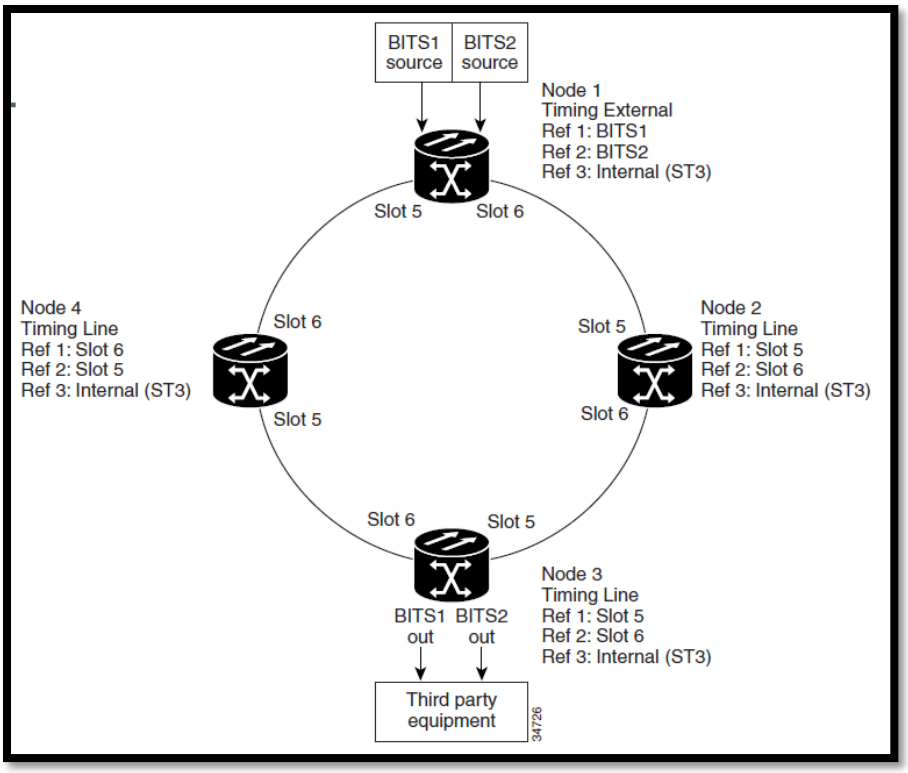
143. On information and belief, the Cisco ’827 Products are available to businesses and individuals throughout the United States.

144. On information and belief, the Cisco ’827 Products are provided to businesses and individuals located in the Eastern District of Texas.

145. On information and belief, the Cisco ’827 Products comprise a phase locked loop adapted to filter and store data indicative of a control signal.

146. On information and belief, the Cisco ’827 Products comprise a control system that generates an output signal whose phase is related to the phase of an input signal.

147. On information and belief, the Cisco ’827 Products comprise a frequency-selective circuit.



CISCO ONS 1545 ENGINEERING PLANNING GUIDE at 7-86 (November 2009).

148. On information and belief, the Cisco ’827 Products include a phase comparator.

149. On information and belief, the Cisco ’827 Products contain a low-pass filter.

150. On information and belief, the Cisco ’827 Products comprise an oscillator coupled in a feedback arrangement.

151. On information and belief, the Cisco ’827 Products include a phase comparator having a first input for the reference clock signal and a second input for the feedback signal.

152. On information and belief, the Cisco ’827 Products contain functionality for sampling values of an error signal.

153. On information and belief, the Cisco ’827 Products contain functionality for sampling an error signal where the error signal is indicative of a phase relationship between a reference clock signal and a feedback signal.

154. On information and belief, Cisco has directly infringed and continues to directly infringe the ’827 patent by, among other things, making, using, offering for sale, and/or selling timing circuitry, including but not limited to the Cisco ’827 Products, which include infringing technology for monitoring the sampled error signal values for a step change in the phase difference between the reference clock signal and the feedback signal. Such products and/or services include, by way of example and without limitation, the Cisco ’827 Products.

155. On information and belief, the ‘827 Products comprise a system for monitoring the sampled error signal values for a step change in the phase difference between the reference clock signal and the feedback signal.

156. On information and belief, the ‘827 Products include functionality for recentering a phase comparator if a step change in the phase difference between the reference clock signal and the feedback signal is detected.

157. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco ’827 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the ’827 patent, including at least claim 28, pursuant to 35 U.S.C. § 271(a).

158. On information and belief, Cisco also indirectly infringes the ’827 patent by actively inducing infringement under 35 USC § 271(b).

159. On information and belief, Cisco has had knowledge of the ’827 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the ’827 patent and knew of its infringement, including by way of this lawsuit.

160. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco ’827 Products and had knowledge that the inducing acts

would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '827 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '827 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '827 Products that have the capability of operating in a manner that infringe one or more of the claims of the '827 patent, including at least claim 28, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '827 Products to utilize the products in a manner that directly infringe one or more claims of the '827 patent.[31] By providing instruction and training to customers and end-users on how to use the Cisco '827 Products in a manner that directly infringes one or more claims of the '827 patent, including at least claim 28, Cisco specifically intended to induce infringement of the '827 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '827 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '827 patent. Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '827 patent, knowing that such use constitutes infringement of the '827 patent.

161. The '827 patent is well-known within the industry as demonstrated by multiple citations to the '827 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the '827 patent

[31] *See, e.g.*, ONS 15454 TIMING ISSUES (Dec. 29, 2004); CISCO ONS 15454 MSPP, ENGINEERING PLANNING GUIDE – RELEASE 4.0 (Aug. 2007); CISCO ONS 15454 ENGINEERING PLANNING GUIDE R5.0 (Nov. 2009); TIMING AND SYNCHRONIZATION ON CISCO ONS 15454 (2014); CISCO ONS 15600 REFERENCE MANUAL, RELEASES 9.1 AND 9.2.1 (Aug. 9, 2012).

without paying a reasonable royalty. Cisco is infringing the '827 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

162. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '827 patent.

163. As a result of Cisco's infringement of the '827 patent, DIFF Scale Operation Research has suffered monetary damages, and seek recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT III
INFRINGEMENT OF U.S. PATENT NO. 7,106,758

164. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

165. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for clock recovery in a packet network.

166. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco routers, including: Cisco MWR 2900 Series Mobile Wireless Routers, Cisco NCS 4200 Series Routers, Cisco NCS 4000 Series Routers, and Cisco ASR 900 Series Routers (collectively, the "Cisco '758 Product(s)").

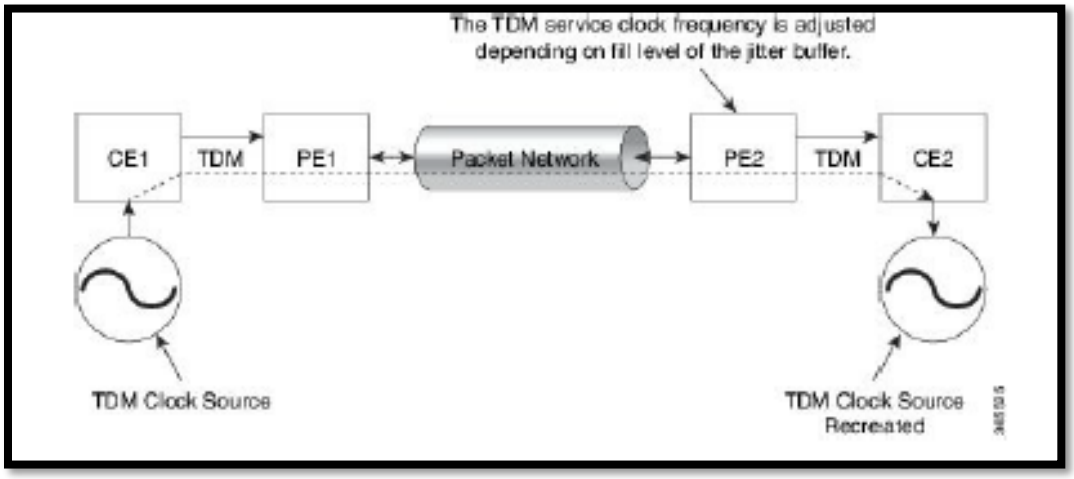
167. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '758 Products in regular business operations.

168. On information and belief, one or more of the Cisco '758 Products include clock recovery technology.

169. On information and belief, the Cisco '758 Products are available to businesses and individuals throughout the United States.

170. On information and belief, the Cisco '758 Products are provided to businesses and individuals located in the Eastern District of Texas.

171. On information and belief, Cisco has directly infringed and continues to directly infringe the '758 patent by, among other things, making, using, offering for sale, and/or selling technology for clock recovery, including but not limited to the Cisco '758 Products, which include infringing technology for adaptive clock recovery. Such products and/or services include, by way of example and without limitation, the Cisco '758 Products.

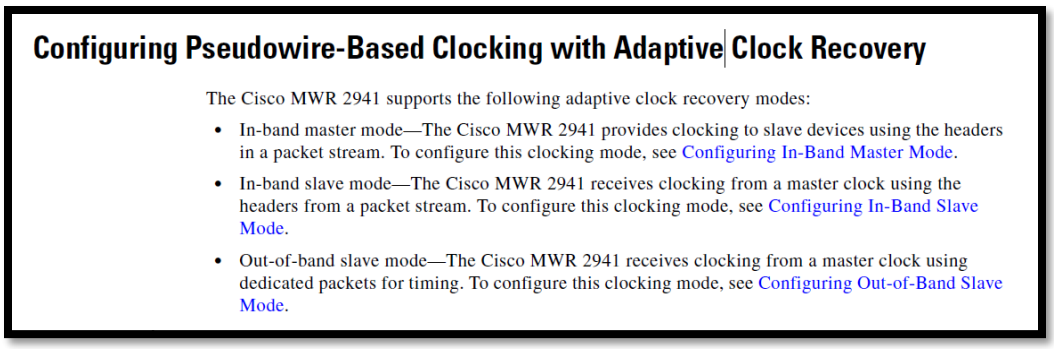


Configuring 48-Port T3/E3 CEM Interface Module, CISCO IOS XE EVEREST 3.18SP (CISCO NCS 4200 SERIES) DOCUMENTATION at 1 (2017) ("Adaptive Clock Recovery (ACR) is an averaging process that negates the effect of random packet delay variation and captures the average rate of transmission of the original bit stream.").

172. On information and belief, the Cisco '758 Products comprise a system for recovering a service clock at a destination node.

173. On information and belief, the Cisco '758 Products include functionality for receiving data packets at a destination node.

174. On information and belief, the Cisco '758 Products systems with functionality for storing data from data packets in a buffer.



Configuring Pseudowire-Based Clocking with Adaptive Clock Recovery

The Cisco MWR 2941 supports the following adaptive clock recovery modes:

- In-band master mode—The Cisco MWR 2941 provides clocking to slave devices using the headers in a packet stream. To configure this clocking mode, see Configuring In-Band Master Mode.
- In-band slave mode—The Cisco MWR 2941 receives clocking from a master clock using the headers from a packet stream. To configure this clocking mode, see Configuring In-Band Slave Mode.
- Out-of-band slave mode—The Cisco MWR 2941 receives clocking from a master clock using dedicated packets for timing. To configure this clocking mode, see Configuring Out-of-Band Slave Mode.

Cisco MWR 2941 Mobile Wireless Edge Router Software Configuration Guide, RELEASE 15.1(1) MR, CISCO MWR 2941 DOCUMENTATION AT 16-1 (2010).

175. On information and belief, the Cisco '758 Products comprise a system for reading the data packets out of the buffer using a locally generated clock.

176. On information and belief, the Cisco '758 Products comprise a system for monitoring a fill level of the buffer over a plurality of time periods.

177. On information and belief, the Cisco '758 Products comprise a buffer having an input that is adapted to receive data packets from another node.

178. On information and belief, the Cisco '758 Products comprise a variable oscillator coupled to the buffer that controls the rate at which data is processed in the node.

179. On information and belief, the Cisco '758 Products comprise a system for controlling the frequency of the recovered clock signal.

- Adaptive Clocking — Adaptive clocking is used when the routers do not have a common clock source. See Figure 4. The clock is derived based on packet arrival rates. Two major types of adaptive clock recovery algorithms are:
  - Based on dejitter buffer fill level
  - Based on packet arrival rate

The clock quality depends on packet size, has less tolerance to packet loss/corruption and introduces unnecessary delay in order to have sufficient number of packets in the buffer for clock recovery. The dejitter buffer size determines the ability of the emulated circuit to tolerate network jitter. The dejitter buffer in CEoP software is configurable up to a maximum of 500 milliseconds.

Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide, CISCO ASR9000 DOCUMENTATION at 1389 (2014) ("Adaptive Clocking — Adaptive clocking is used when the routers do not have a common clock source. See Figure 4. The clock is derived based on packet arrival rates.").

180. On information and belief, the Cisco '758 Products comprise a system for identifying a relative maximum fill level for a buffer during a time period.

181. On information and belief, the Cisco '758 Products use the relative maximum fill levels for the plurality of time periods to control the frequency of the locally generated clock so as to control the rate at which data is read out of the buffer.

182. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '758 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '758 patent, including at least claim 40, pursuant to 35 U.S.C. § 271(a).

183. On information and belief, Cisco also indirectly infringes the '758 patent by actively inducing infringement under 35 USC § 271(b).

184. On information and belief, Cisco has had knowledge of the '758 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '758 patent and knew of its infringement, including by way of this lawsuit.

185. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco '758 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '758 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '758 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '758 Products that have the capability of operating in a manner that infringe one or more of the claims of the '758 patent, including at least claim 40, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '758 Products to utilize the products in a manner that directly infringe one or more claims of the '758 patent.[32] By providing instruction and training to customers and end-users on how to use the Cisco '758 Products in a manner that directly infringes one or more claims of the '758 patent, including at least claim 40, Cisco specifically intended to induce infringement of the '758 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '758 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '758 patent. Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '758 patent, knowing that such use constitutes infringement of the '758 patent.

[32] *See, e.g.*, CISCO MWR 2941 MOBILE WIRELESS EDGE ROUTER SOFTWARE CONFIGURATION GUIDE, RELEASE 15.0(1)MR; AUTONOMIC NETWORKING CONFIGURATION GUIDE, CISCO IOS XE FUJI 16.7.X (NCS 4200 SERIES); CISCO NCS 4200 SERIES SOFTWARE CONFIGURATION GUIDE, CISCO IOS XE EVEREST 16.6.1; CISCO NETWORK CONVERGENCE SYSTEM 4000 SERIES DATA SHEET (Jan. 4, 2017); CISCO ASR ROUTER SERIES CONFIGURATION GUIDE, CISCO IOS XE FUJI 16.7.X (Fed. 8, 2018).

186. The ‘758 patent is well-known within the industry as demonstrated by multiple citations to the ‘758 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the ‘758 patent without paying a reasonable royalty. Cisco is infringing the ‘758 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

187. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘758 patent.

188. As a result of Cisco’s infringement of the ‘758 patent, DIFF Scale Operation Research has suffered monetary damages, and seek recovery in an amount adequate to compensate for Cisco’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT IV
INFRINGEMENT OF U.S. PATENT NO. 6,407,983

189. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

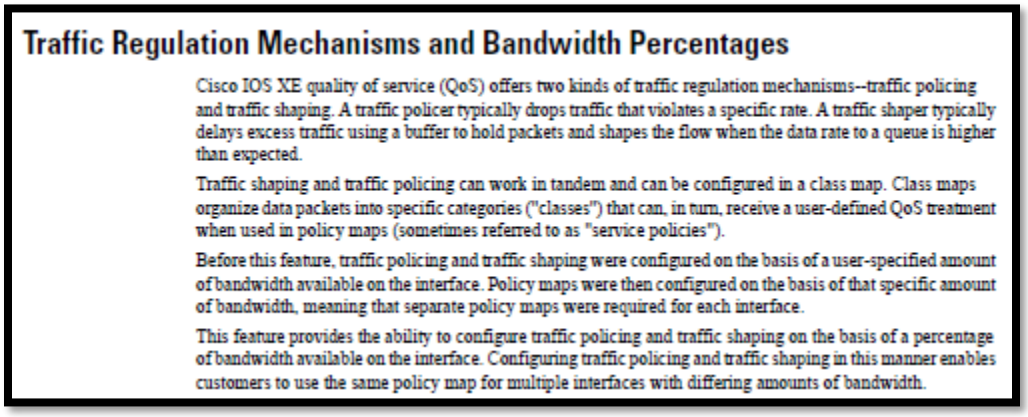
190. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for traffic shaping that deliver data packets from one traffic source at a substantially uniform rate.

191. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco routers, including: ASR 900 Series Aggregation Services Routers; ASR 901 Series Aggregation Services Routers; ASR 901 10G Series Aggregation Services Routers; ASR 901S Series Aggregation Services Routers; ASR 920 Series Aggregation Services Routers; ASR 1000 Series Aggregation

Services Routers; ASR 9000 Series Aggregation Services Routers (collectively, the "Cisco '983 Product(s)").

192. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '983 Products in regular business operations.

193. On information and belief, one or more of the Cisco '983 Products include technology for traffic shaping.



Traffic Regulation Mechanisms and Bandwidth Percentages

Cisco IOS XE quality of service (QoS) offers two kinds of traffic regulation mechanisms--traffic policing and traffic shaping. A traffic policer typically drops traffic that violates a specific rate. A traffic shaper typically delays excess traffic using a buffer to hold packets and shapes the flow when the data rate to a queue is higher than expected.

Traffic shaping and traffic policing can work in tandem and can be configured in a class map. Class maps organize data packets into specific categories ("classes") that can, in turn, receive a user-defined QoS treatment when used in policy maps (sometimes referred to as "service policies").

Before this feature, traffic policing and traffic shaping were configured on the basis of a user-specified amount of bandwidth available on the interface. Policy maps were then configured on the basis of that specific amount of bandwidth, meaning that separate policy maps were required for each interface.

This feature provides the ability to configure traffic policing and traffic shaping on the basis of a percentage of bandwidth available on the interface. Configuring traffic policing and traffic shaping in this manner enables customers to use the same policy map for multiple interfaces with differing amounts of bandwidth.

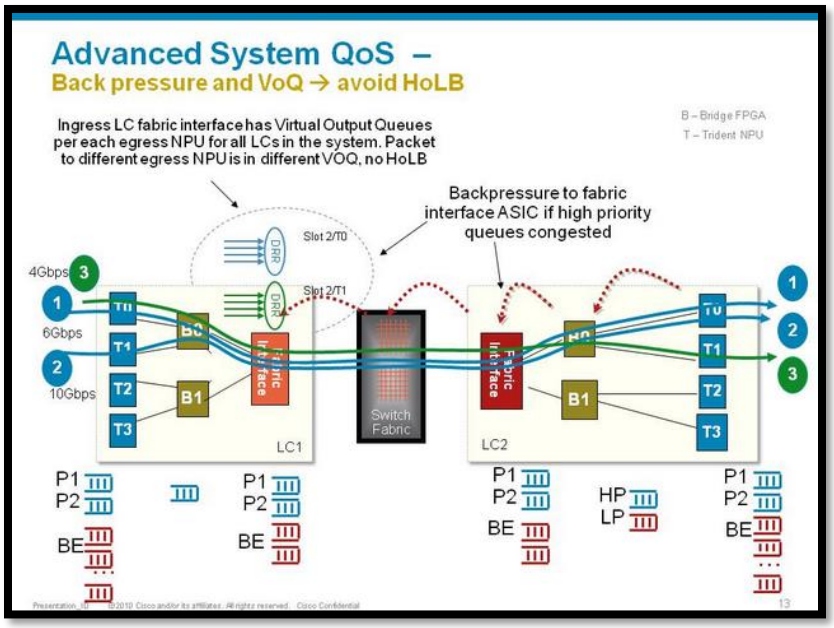
QoS: Policing and Shaping Configuration Guide, CISCO IOS XE16 DOCUMENTATION at 30 (2017) ("Cisco IOS XE quality of service (QoS) offers two kinds of traffic regulation mechanisms--traffic policing and traffic shaping. A traffic policer typically drops traffic that violates a specific rate. A traffic shaper typically delays excess traffic using a buffer to hold packets and shapes the flow when the data rate to a queue is higher than expected.").

194. On information and belief, one or more of the Cisco '983 Products include technology for controlling data traffic on a network to match its transmission to the speed of the remote target interface.

195. On information and belief, the Cisco '983 Products are available to businesses and individuals throughout the United States.

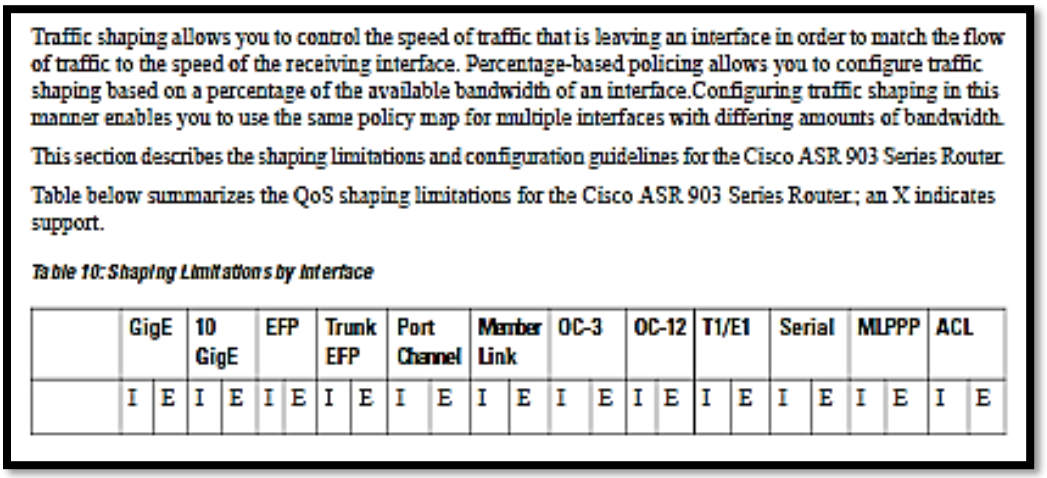
196. On information and belief, the Cisco '983 Products are provided to businesses and individuals located in the Eastern District of Texas.

197. On information and belief, Cisco has directly infringed and continues to directly infringe the '983 patent by, among other things, making, using, offering for sale, and/or selling technology for traffic shaping, including but not limited to the Cisco '983 Products, which include infringing technology for delivering data packets from at least one traffic source at a substantially uniform rate. Such products and/or services include, by way of example and without limitation, the Cisco '983 Products.



ASR9000/XR: Understanding QOS, Default Marking Behavior and Troubleshooting, CISCO SUPPORT COMMUNITY GUIDE (2011), available at: https://supportforums.cisco.com/t5/service-providers-documents/asr9000-xr-understanding-qos-default-marking-behavior-and/ta-p/3128709 (showing traffic shaping policies implements in on the ASR9000 router).

198. On information and belief, the Cisco '983 Products comprise a buffer that receives packets from at least one traffic source.



Traffic shaping allows you to control the speed of traffic that is leaving an interface in order to match the flow of traffic to the speed of the receiving interface. Percentage-based policing allows you to configure traffic shaping based on a percentage of the available bandwidth of an interface.Configuring traffic shaping in this manner enables you to use the same policy map for multiple interfaces with differing amounts of bandwidth.

This section describes the shaping limitations and configuration guidelines for the Cisco ASR 903 Series Router.

Table below summarizes the QoS shaping limitations for the Cisco ASR 903 Series Router.; an X indicates support.

Table 10: Shaping Limitations by Interface

	GigE		10 GigE		EFP		Trunk EFP		Port Channel		Member Link		OC-3		OC-12		T1/E1		Serial		MLPPP		ACL	
	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E	I	E

Quality of Service Configuration Guidelines for Cisco ASR 900 Router Series, CISCO ASR 900 DOCUMENTATION at 51 (July 21, 2017) ("Traffic shaping allows you to control the speed of traffic that is leaving an interface in order to match the flow of traffic to the speed of the receiving interface.").

199. On information and belief, the Cisco '983 Products include a counter that indicates the beginning of each of a number of timeslots over a selectable time period.

200. On information and belief, the Cisco '983 Products comprise a request generator that creates request signals that request timeslots for transmitting data out of the buffer, wherein the requests are distributed over the time period based on at least one table so as to establish a desired data rate for the traffic source.

201. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '983 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '983 patent, including at least claim 8, pursuant to 35 U.S.C. § 271(a).

202. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '983 patent.

203. As a result of Cisco's infringement of the '983 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to

compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT V
INFRINGEMENT OF U.S. PATENT NO. 6,847,609

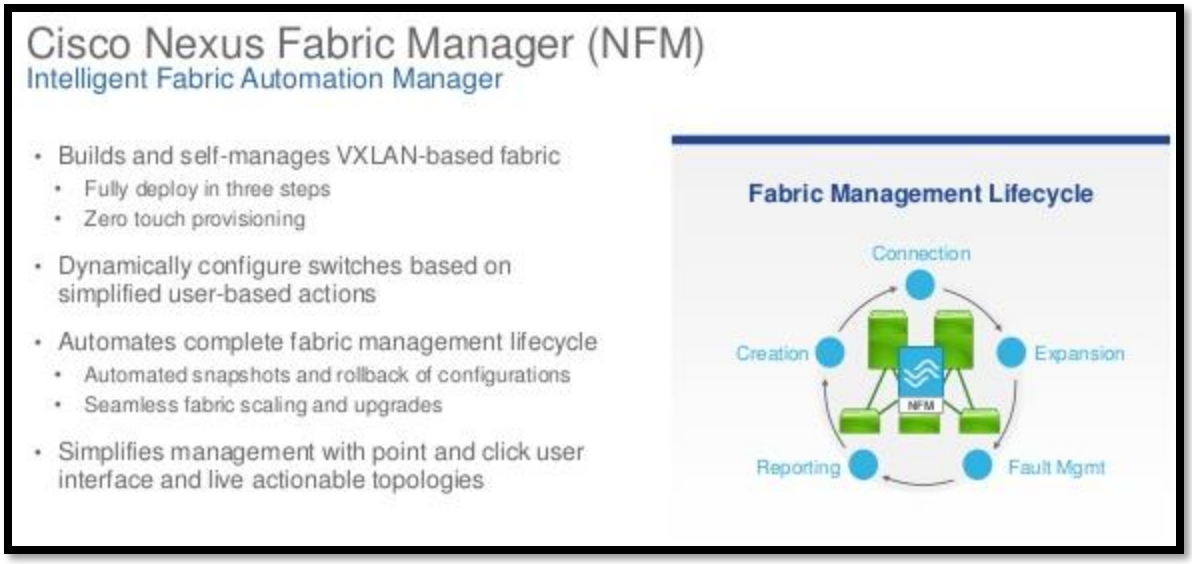
204. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

205. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for network management.

206. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco network management products, including: Cisco Fabric Manager Release 3.3, Fabric Manager Release 4.1, Fabric Manager Release 4.2, and Fabric Manager Release 5.0 (collectively, the "Cisco '609 Product(s)").

207. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '609 Products in regular business operations.

208. On information and belief, one or more of the Cisco '609 Products include technology for managing network elements.



Brenden Buresh, *Network Programmability & DevOps with Open NX-OS*, CISCO PRESENTATION FROM DC-TSA at 51 (March 3, 2016) (showing that the Cisco '609 product provides centralized network management).

209. On information and belief, one or more of the Cisco '609 Products enable management of a network topology in which network nodes interconnect via one or more network switches.

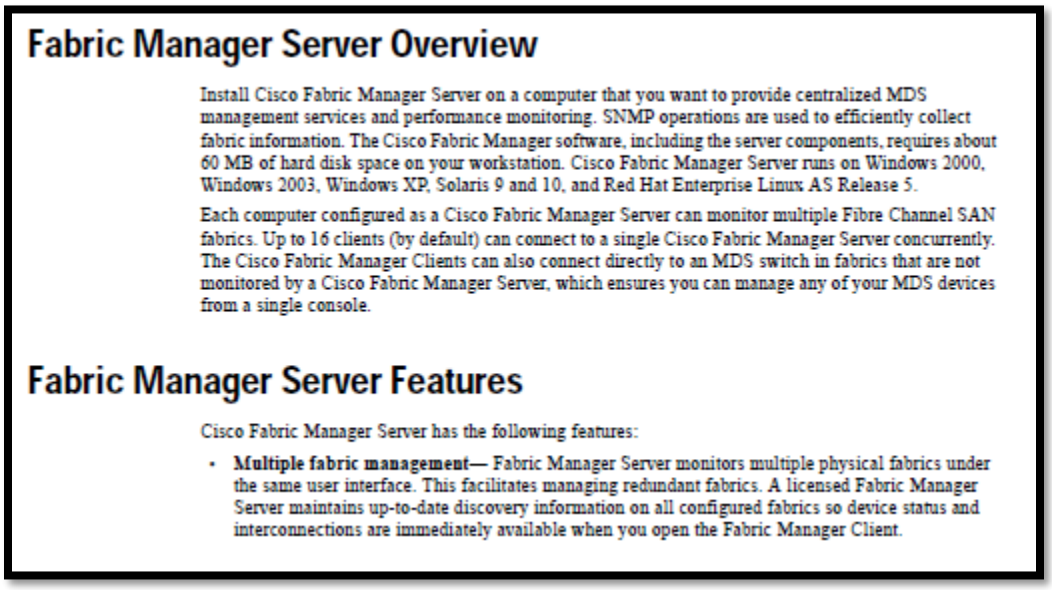
210. On information and belief, the Cisco '609 Products are available to businesses and individuals throughout the United States.

211. On information and belief, the Cisco '609 Products are provided to businesses and individuals located in the Eastern District of Texas.

212. On information and belief, Cisco has directly infringed and continues to directly infringe the '609 patent by, among other things, making, using, offering for sale, and/or selling technology for management of network entities, including but not limited to the Cisco '609 Products, which include infringing technology for network management. Such products and/or services include, by way of example and without limitation, the Cisco '609 Products.

213. On information and belief, the Cisco '609 Products comprise a system that includes a service delivery unit that has a network interface port.

214. On information and belief, the Cisco '609 Products include functionality for a service delivery unit that is configured to store configuration data, control data, billing data, diagnostic data, and/or management data.



Fabric Manager Server Overview

Install Cisco Fabric Manager Server on a computer that you want to provide centralized MDS management services and performance monitoring. SNMP operations are used to efficiently collect fabric information. The Cisco Fabric Manager software, including the server components, requires about 60 MB of hard disk space on your workstation. Cisco Fabric Manager Server runs on Windows 2000, Windows 2003, Windows XP, Solaris 9 and 10, and Red Hat Enterprise Linux AS Release 5.

Each computer configured as a Cisco Fabric Manager Server can monitor multiple Fibre Channel SAN fabrics. Up to 16 clients (by default) can connect to a single Cisco Fabric Manager Server concurrently. The Cisco Fabric Manager Clients can also connect directly to an MDS switch in fabrics that are not monitored by a Cisco Fabric Manager Server, which ensures you can manage any of your MDS devices from a single console.

Fabric Manager Server Features

Cisco Fabric Manager Server has the following features:

- **Multiple fabric management—** Fabric Manager Server monitors multiple physical fabrics under the same user interface. This facilitates managing redundant fabrics. A licensed Fabric Manager Server maintains up-to-date discovery information on all configured fabrics so device status and interconnections are immediately available when you open the Fabric Manager Client.

Cisco Fabric Manager Fundamentals Configuration Guide, CISCO MDS NX-OS RELEASE 5.0 at 3-1 (July 2010) ("Each computer configured as a Cisco Fabric Manager Server can monitor multiple Fibre Channel SAN fabrics. Up to 16 clients (by default) can connect to a single Cisco Fabric Manager Server concurrently.").

215. On information and belief, the Cisco '609 Products are a system that includes a service delivery unit that contains a data port coupleable to at least one local area network ("LAN").

Cisco Fabric Manager 5.0: Visibility and Control for the Unified Data, CISCO MDS 9000 SAN MANAGEMENT DATA SHEET (December 14, 2006) ("A group of two or more Cisco Fabric Manager servers can work together in a federation to provide a higher level of scalability, availability, and reliability for automated data center fabric management tasks. Federation distributes data center fabric management responsibility among the Cisco Fabric Manager servers.").

216. On information and belief, the Cisco '609 Products comprise a system with a central processing unit that enables a network management terminal to view a configurable portion of the data in the memory and to allow a second network management terminal to view a second, configurable portion of the data in the memory to allow shared management of the service delivery unit.

217. On information and belief, the Cisco '609 Products include functionality for connecting to a switch fabric.

218. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '609 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '609 patent, including at least claim 29, pursuant to 35 U.S.C. § 271(a).

219. On information and belief, Cisco also indirectly infringes the ‘609 patent by actively inducing infringement under 35 USC § 271(b).

220. On information and belief, Cisco has had knowledge of the ‘609 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the ‘609 patent and knew of its infringement, including by way of this lawsuit.

221. Alternatively, Cisco has had knowledge of the ‘609 patent since at least March 27, 2012, when U.S. Patent No. 8,114,591, which is owned by Cisco and cites the ‘609 patent as relevant prior art, was issued. Alternatively, Cisco has had knowledge of the ‘609 patent since at least August 19, 2014, when U.S. Patent No. 8,811,281, which is owned by Cisco and cites the ‘609 patent as relevant prior art, was issued.

222. Alternatively, upon information and belief, Cisco has had knowledge of the ‘609 patent since at least December 2009. On June 4, 2009, U.S. Patent Application No. 12/168,650, which cites the ‘609 patent as relevant prior art and was owned by Starent Networks LLC, was published. On information and belief, Cisco acquired Starent Networks LLC in December 2009.

223. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco ‘609 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the ‘609 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the ‘609 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco ‘609 Products that have the capability of operating in a manner that infringe one or more of the claims of the ‘609 patent, including at least claim 29, and Cisco further provides

documentation and training materials that cause customers and end users of the Cisco '609 Products to utilize the products in a manner that directly infringe one or more claims of the '609 patent.[33] By providing instruction and training to customers and end-users on how to use the Cisco '609 Products in a manner that directly infringes one or more claims of the '609 patent, including at least claim 29, Cisco specifically intended to induce infringement of the '609 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '609 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '609 patent. Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '609 patent, knowing that such use constitutes infringement of the '609 patent.

224. The '609 patent is well-known within the industry as demonstrated by multiple citations to the '609 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the '609 patent without paying a reasonable royalty. Cisco is infringing the '609 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

225. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '609 patent.

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[33] *See, e.g.*, CISCO FABRIC MANAGER SERVER FEDERATION DEPLOYMENT GUIDE (2010); CISCO NEXUS 5000 SERIES FABRIC MANAGER CONFIGURATION GUIDE, RELEASE 3.4(1A); RELEASE NOTES FOR CISCO FABRIC MANAGER RELEASE 4.1(1) (July 30, 2009); CISCO FABRIC MANGER INTERFACES CONFIGURATION GUIDE (Nov. 11, 2013); CISCO FABRIC MANAGER FUNDAMENTALS CONFIGURATION GUIDE (Feb. 14, 2018).

226. As a result of Cisco's infringement of the '609 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT VI
INFRINGEMENT OF U.S. PATENT NO. 6,940,810

227. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

228. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for ring networks.

229. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco products that incorporate Cisco IOS XE Release 3S and later or Cisco IOS Release 15S and later, including: Cisco ME 1200 Series Carrier Ethernet Access Devices, Cisco ASR 9000 Series Routers, Cisco ASR 920 Series Aggregation Services Routers, Cisco ME 4600 Series Optical Line Terminals, Cisco ASR 900U Series Routers, Cisco NCS 4200 Series Network Convergence Systems, ME 4600 Series Optical Line Terminals, Cisco ME 3800X Switches, Cisco ME 3600X Switches, Cisco ME 3600X-24CX Switches, and Cisco NCS 4200 Series Network Convergence Systems (collectively, the "Cisco '810 Product(s)").

230. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '810 Products in regular business operations.

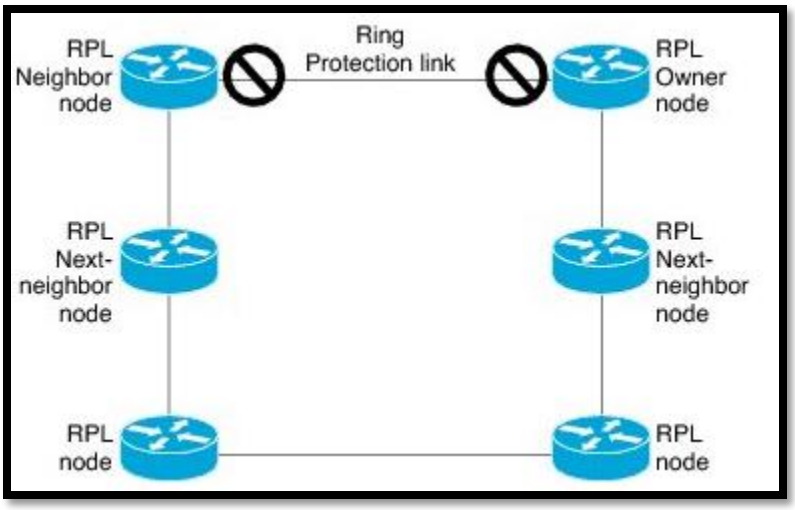
231. On information and belief, one or more of the Cisco '810 Products include technology for protection switching of virtual connections at the data link level.

232. On information and belief, the Cisco ‘810 Products are available to businesses and individuals throughout the United States.

233. On information and belief, the Cisco ‘810 Products are provided to businesses and individuals located in the Eastern District of Texas.

234. On information and belief, Cisco has directly infringed and continues to directly infringe the ‘810 patent by, among other things, making, using, offering for sale, and/or selling networking technology, including but not limited to the Cisco ‘810 Products, which include infringing technology for protection switching of virtual connections at the data link layer. Such products and/or services include, by way of example and without limitation, the Cisco ‘810 Products.

235. The Cisco ‘810 Products comprise a system for a ring network as shown in the below documentation from Cisco.

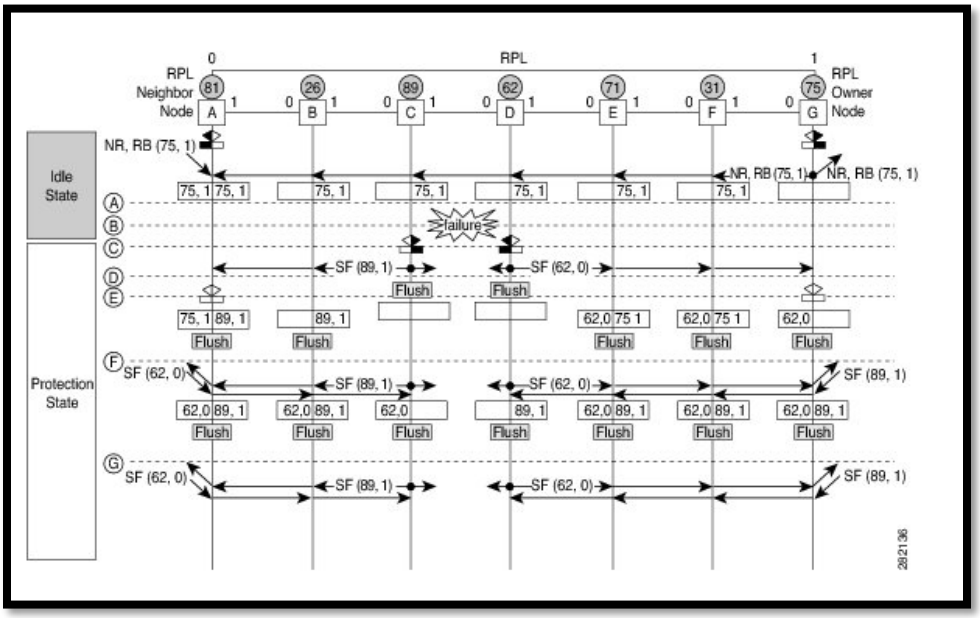


Cisco ASR 9000 Series Aggregation Services Router L2VPN and Ethernet Services Configuration Guide, CISCO IOS XR DOCUMENTATION at LSC-183 (August 5, 2014) (“Each Ethernet ring node is connected to adjacent Ethernet ring nodes participating in the Ethernet ring using two independent links. A ring link never allows formation of loops that affect the network.”).

236. The Cisco ‘810 Products include functionality for two or more uni-directional busses that connect a first and second switch fabrics.

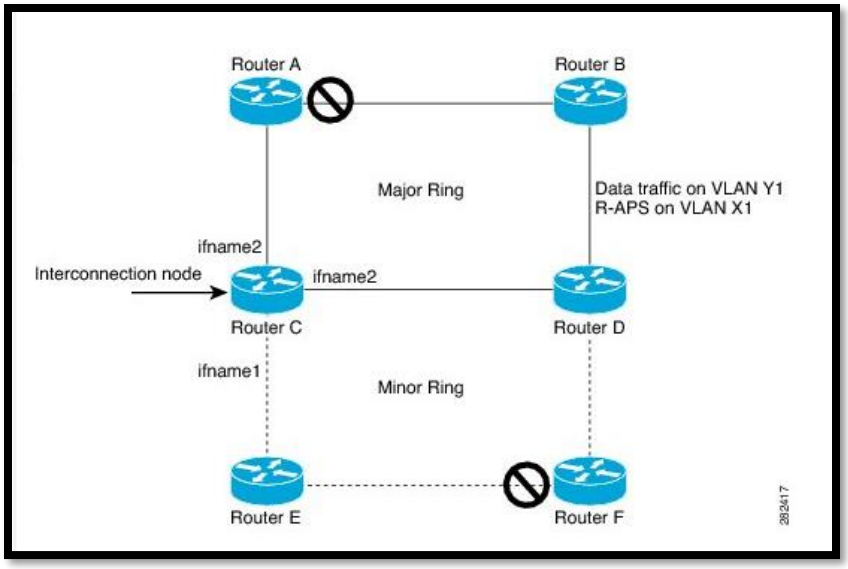
237. The Cisco ‘810 Products are a system wherein ring segments connected between adjacent network elements form routes for transporting cells using virtual connections.

238. The Cisco ‘810 Products comprise a system, wherein for each virtual connection, one route is a working route and the other route is a protection route.



Carrier Ethernet Configuration Guide, Cisco IOS XE Release 3S, CISCO IOS XE DOCUMENTATION at 273 (August 9, 2017) (This figure shows an ethernet ring topology enabled by the Cisco products. The ring network consists of seven Ethernet ring nodes. The ring protection link (RPL) is the ring link between Ethernet ring nodes A and G. Ethernet ring node G is the RPL owner node and can function as an interconnect communicating between two switch fabrics.).

239. The Cisco ‘810 Products comprise a system where the first and second routes are associated with the first and second switch fabrics.



L2VPN and Ethernet Services Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR RELEASE 6.2.X, CISCO ASR 9000 SERIES AGGREGATION SERVICES ROUTER GUIDE (March 1, 2018) (Showing an interconnect where the communications are sent between the two fabrics. Further, the Cisco products enable, "a logical ring running over a physical ring. Such instances are used for various reasons, such as load balancing VLANs over a ring. For example, odd VLANs may go in one direction of the ring, and even VLANs may go in the other direction.").

240. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '810 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '810 patent, including at least claim 13, pursuant to 35 U.S.C. § 271(a).

241. On information and belief, Cisco also indirectly infringes the '810 patent by actively inducing infringement under 35 USC § 271(b).

242. On information and belief, Cisco has had knowledge of the '810 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '810 patent and knew of its infringement, including by way of this lawsuit.

243. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco '810 Products and had knowledge that the inducing acts

would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '810 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '810 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '810 Products that have the capability of operating in a manner that infringe one or more of the claims of the '810 patent, including at least claim 13, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '810 Products to utilize the products in a manner that directly infringe one or more claims of the '810 patent.[34] By providing instruction and training to customers and end-users on how to use the Cisco '810 Products in a manner that directly infringes one or more claims of the '810 patent, including at least claim 13, Cisco specifically intended to induce infringement of the '810 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '810 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '810 patent. Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '810 patent, knowing that such use constitutes infringement of the '810 patent.

244. The '810 patent is well-known within the industry as demonstrated by multiple citations to the '810 patent in published patents and patent applications assigned to technology

[34] *See e.g.*, CARRIER ETHERNET CONFIGURATION GUIDE, CISCO IOS RELEASE 15S (2015); CARRIER ETHERNET CONFIGURATION GUIDE, CISCO IOS XE RELEASE 3S (2017); CISCO ASR 901S SERIES AGGREGATION SERVICES ROUTER SOFTWARE CONFIGURATION GUIDE (2015); and CISCO ME 3800X AND ME 3600X AND ME 3600X-24CX SWITCH SOFTWARE CONFIGURATION GUIDE (2013).

companies and academic institutions. Cisco is utilizing the technology claimed in the '810 patent without paying a reasonable royalty. Cisco is infringing the '810 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

245. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '810 patent.

246. As a result of Cisco's infringement of the '810 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT VII
INFRINGEMENT OF U.S. PATENT NO. 6,990,110

247. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

248. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for automatic connection activation of permanent virtual circuits in communication networks.

249. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco Routers Integrated Services Routers running Cisco IOS XE Release 2 and later (collectively, the "Cisco '110 Product(s)").

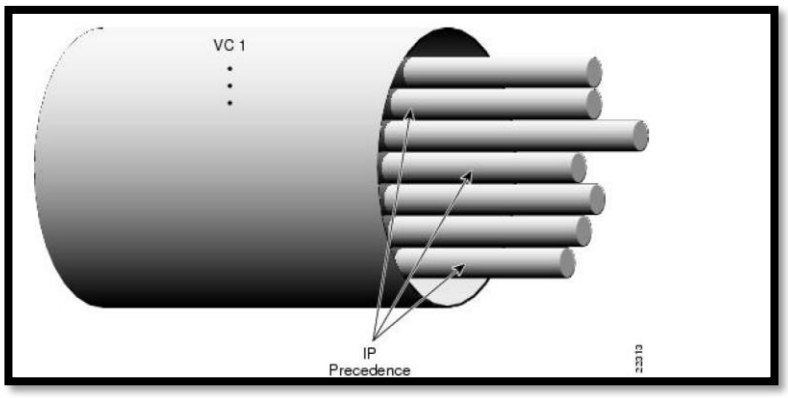
250. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '110 Products in regular business operations.

251. On information and belief, one or more of the Cisco '110 Products include technology for improvements in end-to-end provisioning of communication systems.

252. On information and belief, the Cisco '110 Products are available to businesses and individuals throughout the United States.

253. On information and belief, the Cisco '110 Products are provided to businesses and individuals located in the Eastern District of Texas.

254. On information and belief, Cisco has directly infringed and continues to directly infringe the '110 patent by, among other things, making, using, offering for sale, and/or selling technology for automatic connection activation, including but not limited to the Cisco '110 Products, which include infringing technology for automatic permanent virtual circuit connection activation. Such products and/or services include, by way of example and without limitation, the Cisco '110 Products.



CISCO ASYNCHRONOUS TRANSFER MODE CONFIGURATION Guide at (2016) ("ATM VC bundle management allows you to define an ATM VC bundle and add VCs to it. Each VC of a bundle has its own ATM traffic class and ATM traffic parameters. You can apply attributes and characteristics to discrete VC bundle members or you can apply them collectively at the bundle level.").

255. On information and belief, the Cisco '110 Products comprise a system for detecting initiation of communication at a user network interface between a first and second network element.

256. On information and belief, the Cisco '110 Products include functionality for identifying a virtual circuit identifier of the first network element.

> The Local Template-Based ATM Provisioning feature enables ATM permanent virtual circuits (PVCs) to be provisioned automatically as needed from a local configuration. ATM PVC autoprovisioning can be configured on a PVC, an ATM PVC range, or a VC class. If a VC class configured with ATM PVC autoprovisioning is assigned to an interface, all the PVCs on that interface will be autoprovisioned; this configuration is sometimes referred to as an *infinite range*.

ASYNCHRONOUS TRANSFER MODE CONFIGURATION GUIDE, CISCO IOS XE RELEASE 2 at 83 (2011) ("The Local Template-Based ATM Provisioning feature enables ATM permanent virtual circuits (PVCs) to be provisioned automatically as needed from a local configuration.").

257. On information and belief, the Cisco '110 Products include functionality for identifying a second virtual circuit identifier of the first network element.

pvc *vpi*/*vci* **Example:** `Router(config-if)# pvc 8/35`	Creates an ATM PVC for each end node (up to ten) with which the router communicates. Enters ATM virtual circuit configuration mode. When a PVC is defined, AAL5SNAP encapsulation is defined by default. Use the **encapsulation** command to change this, as shown in Step 3. The VPI and VCI arguments cannot be simultaneously specified as zero; if one is 0, the other cannot be 0. For details about this command and additional parameters that can be set, see the Cisco IOS Wide-Area Networking Command Reference.

CISCO 800 SERIES INTEGRATED SERVICES ROUTERS SOFTWARE CONFIGURATION GUIDE at 359 (December 30, 2016) ("Creates an ATM PVC for each end node (up to ten) with which the router communicates. Enters ATM virtual circuit configuration mode. When a PVC is defined, AAL5SNAP encapsulation is defined by default.").

258. On information and belief, the Cisco '110 Products are a system that enables creation of a translation connection between the first and second network elements.

259. On information and belief, the Cisco '110 Products enable identifying a virtual circuit identifier of the second network element that comprises receiving traffic from the second network element containing one virtual circuit identifier of the second network element and storing at least one virtual circuit identifier of the second network element.

260. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '110 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '110 patent, including at least claim 1, pursuant to 35 U.S.C. § 271(a).

261. On information and belief, Cisco also indirectly infringes the '110 patent by actively inducing infringement under 35 USC § 271(b).

262. On information and belief, Cisco has had knowledge of the '110 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '110 patent and knew of its infringement, including by way of this lawsuit.

263. Alternatively, Cisco has had knowledge of the '110 patent since at least July 6, 2010, when U.S. Patent No. 7,751,412, which is owned by Cisco and cites the '110 patent as relevant prior art, was issued. Alternatively, Cisco has had knowledge of the '110 patent since at least April 21, 2009, when U.S. Patent No. 7,523,185, which is owned by Cisco and cites the '110 patent as relevant prior art, was issued. Alternatively, Cisco has had knowledge of the '110 patent since at least December 8, 2009, when U.S. Patent No. 7,631,055, which is owned by Cisco and cites the '110 patent as relevant prior art, was issued. Alternatively, Cisco has had knowledge of the '110 patent since at least October 16, 2012, when U.S. Patent No. 8,289,873, which is owned

by Cisco and cites the '110 patent as relevant prior art, was issued. Alternatively, Cisco has had knowledge of the '110 patent since at least February 19, 2013, when U.S. Patent No. 8,379,648, which is owned by Cisco and cites the '110 patent as relevant prior art, was issued.

264. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco '110 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '110 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '110 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '110 Products that have the capability of operating in a manner that infringe one or more of the claims of the '110 patent, including at least claim 1, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '110 Products to utilize the products in a manner that directly infringe one or more claims of the '110 patent.[35] By providing instruction and training to customers and end-users on how to use the Cisco '110 Products in a manner that directly infringes one or more claims of the '110 patent, including at least claim 1, Cisco specifically intended to induce infringement of the '110 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '110 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '110 patent.

[35] *See, e.g.*, CISCO CARRIER PACKET TRANSPORT (CPT) 50 DATA SHEET (Jan. 15, 2016); CISCO CARRIER PACKET TRANSPORT (CPT) 200 DATA SHEET (Aug. 10, 2014); CISCO CARRIER PACKET TRANSPORT (CPT) 600 (Jan. 14, 2016); CISCO CPT CONFIGURATION GUIDE-CTC AND DOCUMENTATION RELEASE 9.7.0 AND CISCO IOS RELEASE 15.2(02) (Feb. 18, 2018); CISCO CPT COMMAND REFERENCE GUIDE-CTC AND DOCUMENTATION RELEASE 9.5.X AND CISCO IOS RELEASE 15.2(01) (Nov. 11, 2013).

Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '110 patent, knowing that such use constitutes infringement of the '110 patent.

265. The '110 patent is well-known within the industry as demonstrated by multiple citations to the '110 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the '110 patent without paying a reasonable royalty. Cisco is infringing the '110 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

266. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '110 patent.

267. As a result of Cisco's infringement of the '110 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT VIII
INFRINGEMENT OF U.S. PATENT NO. 6,721,328

268. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

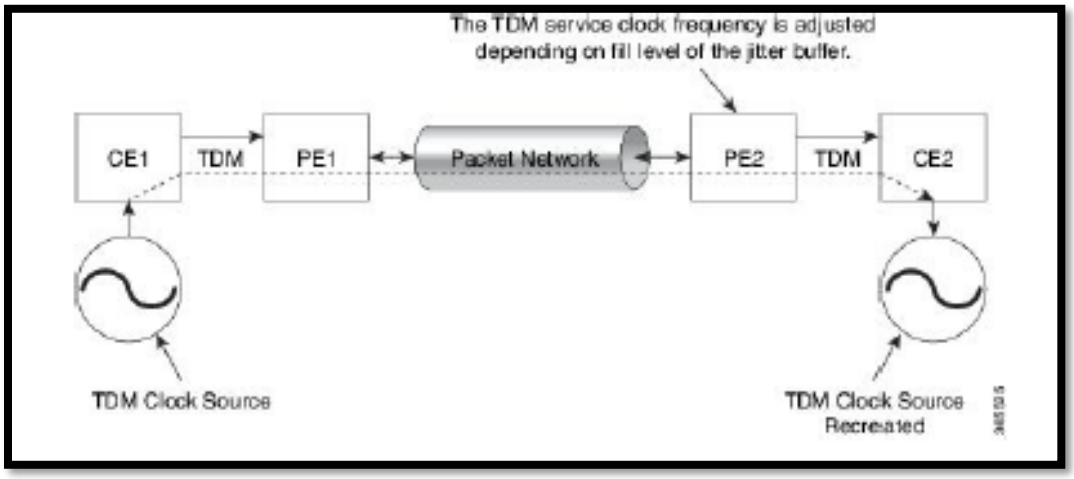
269. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for clock recovery in a packet network.

270. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco routers, including: Cisco MWR 2900 Series Mobile Wireless Routers, Cisco NCS 4200 Series Routers,

Cisco NCS 4000 Series Routers, and Cisco ASR 900 Series Routers (collectively, the "Cisco '328 Product(s)").

271. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '328 Products in regular business operations.

272. On information and belief, one or more of the Cisco '328 Products include technology for clock recovery in a packet network.



Configuring 48-Port T3/E3 CEM Interface Module, CISCO IOS XE EVEREST 3.18SP (CISCO NCS 4200 SERIES) DOCUMENTATION at 1 (2017) ("Adaptive Clock Recovery (ACR) is an averaging process that negates the effect of random packet delay variation and captures the average rate of transmission of the original bit stream.")

273. On information and belief, the Cisco '328 Products are available to businesses and individuals throughout the United States.

274. On information and belief, the Cisco '328 Products are provided to businesses and individuals located in the Eastern District of Texas.

275. On information and belief, Cisco has directly infringed and continues to directly infringe the '328 patent by, among other things, making, using, offering for sale, and/or selling technology for clock recovery, including but not limited to the Cisco '328 Products, which include

infringing technology for clock recovery in a packet network. Such products and/or services include, by way of example and without limitation, the Cisco '328 Products.

276. On information and belief, the Cisco '328 Products comprise a system for receiving data packets at a destination node.

277. On information and belief, the Cisco '328 Products comprise a system for storing data packets in a buffer.

- Adaptive Clocking — Adaptive clocking is used when the routers do not have a common clock source. See Figure 4. The clock is derived based on packet arrival rates. Two major types of adaptive clock recovery algorithms are:
  - Based on dejitter buffer fill level
  - Based on packet arrival rate

The clock quality depends on packet size, has less tolerance to packet loss/corruption and introduces unnecessary delay in order to have sufficient number of packets in the buffer for clock recovery. The dejitter buffer size determines the ability of the emulated circuit to tolerate network jitter. The dejitter buffer in CEoP software is configurable up to a maximum of 500 milliseconds.

Cisco ASR 9000 Series Aggregation Services Router Interface and Hardware Component Configuration Guide, CISCO ASR9000 DOCUMENTATION at 1389 (2014) ("Adaptive Clocking — Adaptive clocking is used when the routers do not have a common clock source. See Figure 4. The clock is derived based on packet arrival rates.").

278. On information and belief, the Cisco '328 Products enable reading the data packets out of the buffer using a locally generated clock.

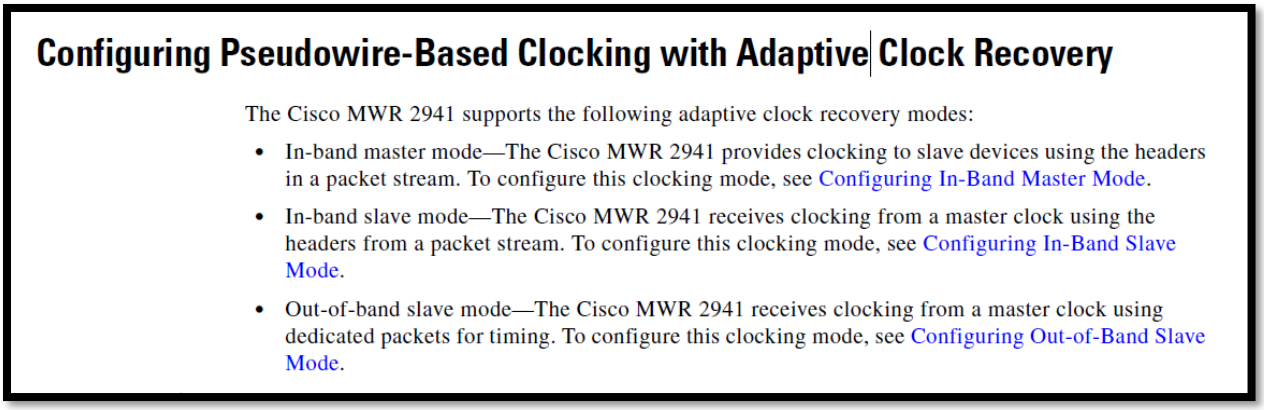
279. On information and belief, the Cisco '328 Products monitor a fill level of the buffer over a first period of time.

280. On information and belief, the Cisco '328 Products identify a relative maximum fill level for the buffer during the first period of time.

281. On information and belief, the Cisco '328 Products identify a relative maximum fill level by comparing read and write address for the buffer and updating a register for a period of

time when a buffer fill level, based on the difference between the read and write addresses is larger than a value previously stored in the register.

282. On information and belief, the Cisco '328 Products use the relative maximum fill level to control a frequency of the locally generated clock so as to control the rate at which data is read out of the buffer.



Configuring Pseudowire-Based Clocking with Adaptive Clock Recovery

The Cisco MWR 2941 supports the following adaptive clock recovery modes:

- In-band master mode—The Cisco MWR 2941 provides clocking to slave devices using the headers in a packet stream. To configure this clocking mode, see Configuring In-Band Master Mode.
- In-band slave mode—The Cisco MWR 2941 receives clocking from a master clock using the headers from a packet stream. To configure this clocking mode, see Configuring In-Band Slave Mode.
- Out-of-band slave mode—The Cisco MWR 2941 receives clocking from a master clock using dedicated packets for timing. To configure this clocking mode, see Configuring Out-of-Band Slave Mode.

Cisco MWR 2941 Mobile Wireless Edge Router Software Configuration Guide, RELEASE 15.1(1) MR, CISCO MWR 2941 DOCUMENTATION AT 16-1 (2010).

283. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '328 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '328 patent, including at least claim 1, pursuant to 35 U.S.C. § 271(a).

284. On information and belief, Cisco also indirectly infringes the '328 patent by actively inducing infringement under 35 USC § 271(b).

285. On information and belief, Cisco has had knowledge of the '328 patent since at least service of this Complaint or shortly thereafter, and on information and belief, Cisco knew of the '328 patent and knew of its infringement, including by way of this lawsuit.

286. Alternatively, Cisco has had knowledge of the '328 patent since at least April 4, 2006, when U.S. Patent No. 7,023,883, which is owned by Cisco and cites the '328 patent as relevant prior art, was issued.

287. On information and belief, Cisco intended to induce patent infringement by third-party customers and users of the Cisco '328 Products and had knowledge that the inducing acts would cause infringement or was willfully blind to the possibility that its inducing acts would cause infringement. Cisco specifically intended and was aware that the normal and customary use of the accused products would infringe the '328 patent. Cisco performed the acts that constitute induced infringement, and would induce actual infringement, with knowledge of the '328 patent and with the knowledge that the induced acts would constitute infringement. For example, Cisco provides the Cisco '328 Products that have the capability of operating in a manner that infringe one or more of the claims of the '328 patent, including at least claim 1, and Cisco further provides documentation and training materials that cause customers and end users of the Cisco '328 Products to utilize the products in a manner that directly infringe one or more claims of the '328 patent.[36] By providing instruction and training to customers and end-users on how to use the Cisco '328 Products in a manner that directly infringes one or more claims of the '328 patent, including at least claim 1, Cisco specifically intended to induce infringement of the '328 patent. On information and belief, Cisco engaged in such inducement to promote the sales of the Cisco '328 Products, e.g., through Cisco user manuals, product support, marketing materials, and training materials to actively induce the users of the accused products to infringe the '328 patent.

[36] *See, e.g.*, CISCO MWR 2941 MOBILE WIRELESS EDGE ROUTER SOFTWARE CONFIGURATION GUIDE, RELEASE 15.0(1)MR; AUTONOMIC NETWORKING CONFIGURATION GUIDE, CISCO IOS XE FUJI 16.7.X (NCS 4200 SERIES); CISCO NCS 4200 SERIES SOFTWARE CONFIGURATION GUIDE, CISCO IOS XE EVEREST 16.6.1; CISCO NETWORK CONVERGENCE SYSTEM 4000 SERIES DATA SHEET (Jan. 4, 2017); CISCO ASR ROUTER SERIES CONFIGURATION GUIDE, CISCO IOS XE FUJI 16.7.X (Fed. 8, 2018).

Accordingly, Cisco has induced and continues to induce users of the accused products to use the accused products in their ordinary and customary way to infringe the '328 patent, knowing that such use constitutes infringement of the '328 patent.

288. The '328 patent is well-known within the industry as demonstrated by multiple citations to the '328 patent in published patents and patent applications assigned to technology companies and academic institutions. Cisco is utilizing the technology claimed in the '328 patent without paying a reasonable royalty. Cisco is infringing the '328 patent in a manner best described as willful, wanton, malicious, in bad faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate.

289. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '328 patent.

290. As a result of Cisco's infringement of the '328 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT IX
INFRINGEMENT OF U.S. PATENT NO. 6,216,166

291. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

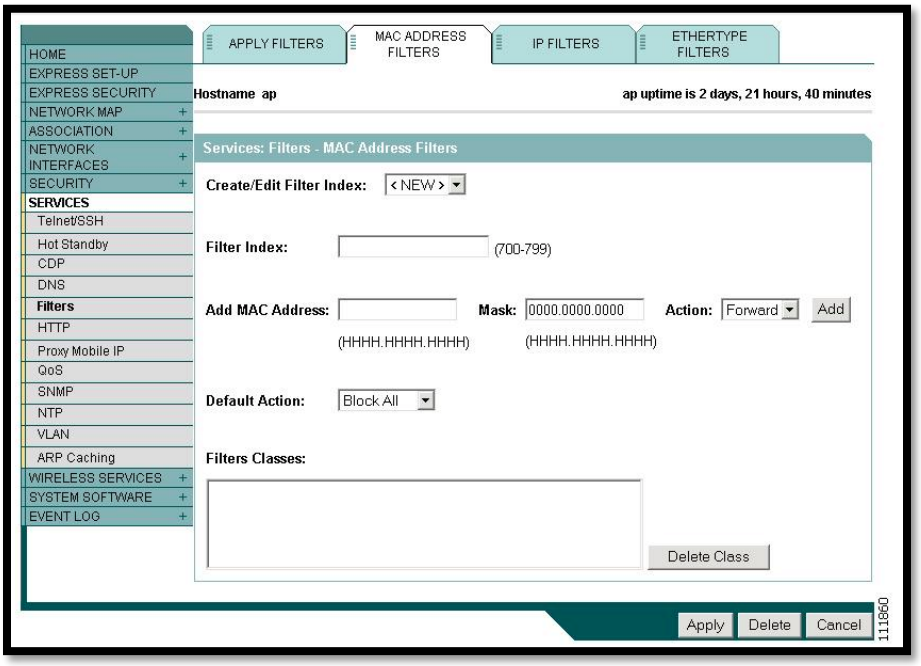
292. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for network management.

293. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco network security enabling switches including the following products: Cisco Catalyst 9400 Series

Switches, Cisco Catalyst 9300 Series Switches, Cisco Catalyst 2960-X and XR Series Switches, Cisco Catalyst 4500E Series Switches, Cisco Catalyst 3850 Series Switches, Cisco Catalyst 3650 Series Switches (collectively, the "Cisco '166 Product(s)").

294. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco '166 Products in regular business operations.

295. On information and belief, one or more of the Cisco '166 Products include technology for policing network elements.



CISCO IOS SOFTWARE CONFIGURATION GUIDE at 16-4 (February 18, 2018) (showing the MAC Address Filters Page on the Cisco router configuration page).

296. On information and belief, the Cisco '166 Products are available to businesses and individuals throughout the United States.

297. On information and belief, the Cisco '166 Products are provided to businesses and individuals located in the Eastern District of Texas.

298. On information and belief, Cisco has directly infringed and continues to directly infringe the ‘166 patent by, among other things, making, using, offering for sale, and/or selling technology for network management, including but not limited to the Cisco ‘166 Products, which include infringing technology for policing network elements using a media access control address. Such products and/or services include, by way of example and without limitation, the Cisco ‘166 Products.

299. On information and belief, the Cisco ‘166 Products include network elements that perform switching and transport functions.

300. On information and belief, the Cisco ‘166 Products include a policing network element that terminates a local area network group of data with a corrupted media access address relating to a network element.

301. On information and belief, the Cisco ‘166 Products contain transmission media coupling the network elements and policing network elements to each other.

302. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco ‘166 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the ‘166 patent, including at least claim 1, pursuant to 35 U.S.C. § 271(a).

303. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the ‘166 patent.

304. As a result of Cisco’s infringement of the ‘166 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco’s infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

COUNT X
INFRINGEMENT OF U.S. PATENT NO. 6,859,430

305. DIFF Scale Operation Research references and incorporates by reference the preceding paragraphs of this Complaint as if fully set forth herein.

306. Cisco designs, makes, uses, sells, and/or offers for sale in the United States products and/or services for protection switching in a ring network.

307. Cisco designs, makes, sells, offers to sell, imports, and/or uses Cisco products that incorporate Cisco IOS XE Release 3S and later or Cisco IOS Release 15S and later including the following products: ME 1200 Series Carrier Ethernet Access Devices, Cisco ASR 9000 Series Routers, Cisco ASR 920 Series Aggregation Services Routers, Cisco ME 4600 Series Optical Line Terminals; Cisco ASR 900U Series Routers; Cisco NCS 4200 Series Network Convergence Systems; ME 4600 Series Optical Line Terminals, Cisco ME 3800X Switches, Cisco ME 3600X Switches, Cisco ME 3600X-24CX Switches, and Cisco NCS 4200 Series Network Convergence Systems (collectively, the "Cisco '430 Product(s)").

308. On information and belief, one or more Cisco subsidiaries and/or affiliates use the Cisco ‘430 Products in regular business operations.

309. On information and belief, one or more of the Cisco ‘430 Products include technology for network management.

310. On information and belief, the Cisco ‘430 Products are available to businesses and individuals throughout the United States.

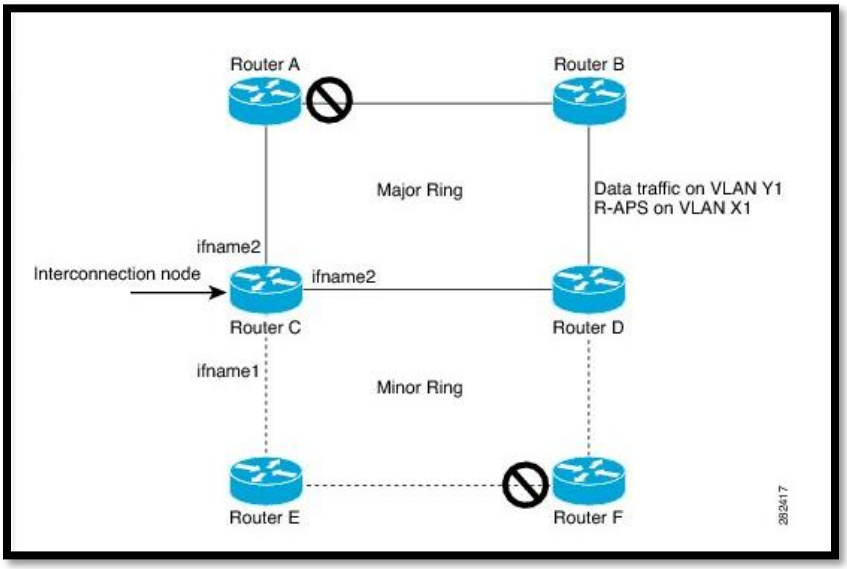
311. On information and belief, the Cisco ‘430 Products are provided to businesses and individuals located in the Eastern District of Texas.

312. On information and belief, Cisco has directly infringed and continues to directly infringe the ‘430 patent by, among other things, making, using, offering for sale, and/or selling

technology for network management, including but not limited to the Cisco '430 Products, which include infringing technology for protection switching in a ring network. Such products and/or services include, by way of example and without limitation, the Cisco '430 Products.

313. On information and belief, the Cisco '430 Products comprise a number of network elements.

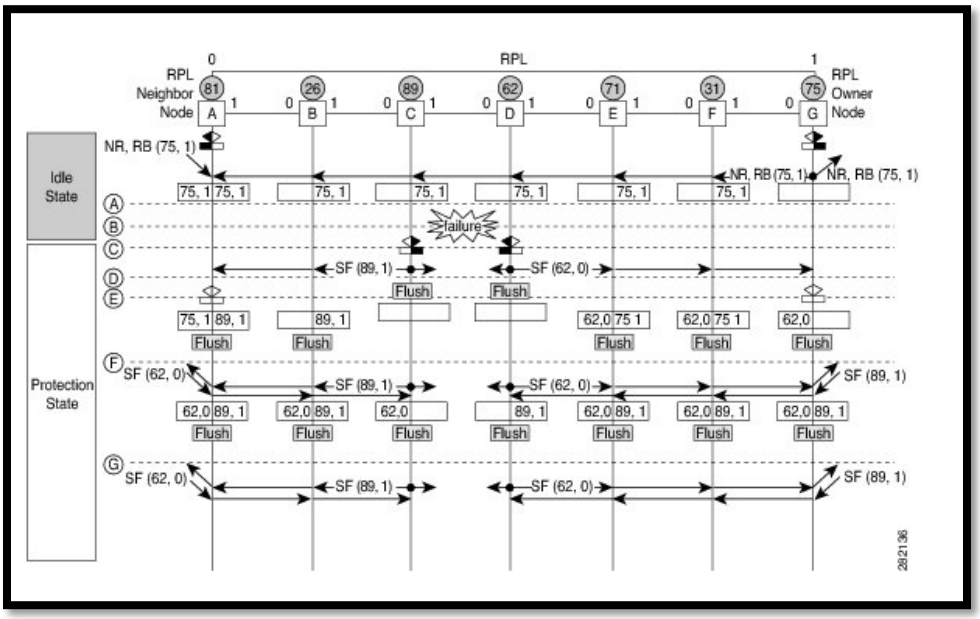
314. On information and belief, the Cisco '430 Products contain ring segments coupled between adjacent network elements to form first and second routes for transporting cells using virtual connections wherein, for each virtual connection, one route is a working route and the other route is a protection route.



L2VPN and Ethernet Services Configuration Guide for Cisco ASR 9000 Series Routers, IOS XR RELEASE 6.2.X, CISCO ASR 9000 SERIES AGGREGATION SERVICES ROUTER GUIDE (March 1, 2018) (Showing an interconnect where the communications are sent between the two fabrics. Further, the Cisco products enable, "a logical ring running over a physical ring. Such instances are used for various reasons, such as load balancing VLANs over a ring. For example, odd VLANs may go in one direction of the ring, and even VLANs may go in the other direction.").

315. On information and belief, the Cisco '430 Products contain functionality wherein each network element separately tracks the status of a number of virtual connections on each route

such that when an error is detected on the working route for a virtual connection, the network element switches to the protection route for the virtual connection.



Carrier Ethernet Configuration Guide, Cisco IOS XE Release 3S, CISCO IOS XE DOCUMENTATION at 273 (August 9, 2017) (This figure shows an ethernet ring topology enabled by the Cisco products. The ring network consists of seven Ethernet ring nodes. The ring protection link (RPL) is the ring link between Ethernet ring nodes A and G. Ethernet ring node G is the RPL owner node and can function as an interconnect communicating between two switch fabrics.).

316. On information and belief, the Cisco '430 Products comprise a system wherein each network element includes two ring interface modules having a microprocessor, a physical layer device, and a switch fabric.

317. By making, using, testing, offering for sale, and/or selling products and services, including but not limited to the Cisco '430 Products, Cisco has injured DIFF Scale Operation Research and is liable for directly infringing one or more claims of the '430 patent, including at least claim 10, pursuant to 35 U.S.C. § 271(a).

318. To the extent applicable, the requirements of 35 U.S.C. § 287(a) have been met with respect to the '430 patent.

319. As a result of Cisco's infringement of the '430 patent, DIFF Scale Operation Research has suffered monetary damages, and seeks recovery in an amount adequate to compensate for Cisco's infringement, but in no event less than a reasonable royalty for the use made of the invention by Cisco together with interest and costs as fixed by the Court.

PRAYER FOR RELIEF

WHEREFORE, DIFF Scale Operation Research respectfully requests that this Court enter:

A. A judgment in favor of DIFF Scale Operation Research that Cisco has infringed, either literally and/or under the doctrine of equivalents, the '413, '827, '758, '983, '609, '810, '110, '328, '166, and '430 patents;

B. An award of damages resulting from Cisco's acts of infringement in accordance with 35 U.S.C. § 284;

C. A judgment and order finding that Cisco's infringement was willful, wanton, malicious, bad-faith, deliberate, consciously wrongful, flagrant, or characteristic of a pirate within the meaning of 35 U.S.C. § 284 and awarding to DIFF Scale Operation Research enhanced damages.

D. A judgment and order finding that this is an exceptional case within the meaning of 35 U.S.C. § 285 and awarding to DIFF Scale Operation Research their reasonable attorneys' fees against Cisco.

E. Any and all other relief to which DIFF Scale Operation Research may show themselves to be entitled.

JURY TRIAL DEMANDED

Pursuant to Rule 38 of the Federal Rules of Civil Procedure, DIFF Scale Operation Research, LLC requests a trial by jury of any issues so triable by right.

Dated: March 8, 2018

Respectfully submitted,

/s/ Daniel P. Hipskind

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