

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

CISCO SYSTEMS, INC.,
Petitioner,

v.

ORCKIT CORPORATION,
Patent Owner.

Case IPR2023-00401
Patent 7,545,740

EXHIBIT 2024

DECLARATION OF MIGUEL GOMEZ

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I. INTRODUCTION

1. My name is Miguel Gomez. I have been retained as an expert witness to provide my independent opinion in regards with matters at issue in the *inter partes* review of U.S. 7,545,740 (“the ’740 Patent”) in the IPR2023-00401 proceeding. I have been retained by Orckit Corporation (“Orckit”), the Patent Owner, in the above proceedings. Petitioner in this case is Cisco Systems, Inc. (“Cisco”).

2. Unless otherwise noted, the statements made herein are based on my personal knowledge, and if called to testify about this declaration, I could and would do so competently and truthfully.

3. My CV is being submitted herewith as Exhibit 2025 to this proceeding and is summarized in Section II, *infra*.

4. I am not a legal expert and offer no opinions on the law. However, I have been informed by counsel of the various legal standards that apply, and I have applied those standards in arriving at my conclusions.

5. The opinions I set forth herein are my own and are based on my education, experience, training, and skill I have accumulated.

II. QUALIFICATIONS

6. I received a Bachelor of Science in Electrical Engineering degree from Yale University in 1983. I have thirty-five years of experience in the design and development of hardware and software technology used in computer systems,

communications systems, networking and storage infrastructure, and database systems. My experience includes extensive knowledge of computer operating systems, programming languages, and mobile and embedded applications. I am also highly skilled in the use of microelectronics simulation software, ASIC and FPGA coding, in hardware design languages, including Verilog and VHDL. I'm also skilled at programming for embedded systems and applications in C , C++ and C#.

7. From August 2006 to March 2009, I was VP of engineering for ActSolar. ActSolar was a solar power converter and instrumentation company where I developed the system architecture that defined the hardware and software for a solar inverter and a data gathering and control sub-system. I wrote a control program in the C programming language to manage power conversion for the solar inverter. I also managed a small team of engineers that built the software defined radio responsible for retrieving solar panel data. The data gatherer utilized the IEEE 802.15.4 low-rate wireless personal area network (WPAN) standard to retrieve power and temperature readings from each solar panel and aggregate that data at a server. This information was used to maximize the solar array output.

8. In 2006, ActSolar was sold to National Semiconductor. The transfer of technology included the software radio for data collection, the inverter and a variant of the power converter hardware that performed shading compensation.

9. From September 2004 to August 2005, I was a consultant for BridgeWave Inc. I built a 10 Gbps Ethernet test platform to facilitate manufacturing tests of BridgeWave's high speed wireless network system. This system replaced the Smart Bits Ethernet test analyzer used in the manufacturing test environment. I also built a test generator, specifically an Ethernet packet generator, which generated packets of various sizes, address spaces, payload and checksums. I built a test receiver and analyzer which detected various failure mechanisms, maintained statistics and reported them to a user interface written in Lab View. A Xilinx Vertex II FPGA was employed in the first version of the test platform and a Xilinx Spartan 3e in the second version.

10. From September 2003 to March 2004, I was a consultant for PA Consulting Group. I provided hardware evaluation services for corporate mergers and acquisitions. These services included systems and hardware reviews in the following areas: (1) Analysis of system performance to the cost of the hardware implementation; (2) Review of the VHDL and Verilog code implementations, documentation and development strategies; (3) VHDL and Verilog code management including compilation processes, simulation, test coverage, bug tracking and source code control; (4) FPGA and ASIC tool chain management; (5) Circuit board design and layout for production environments; (6) Circuit board certification testing for FCC, UL, and Environmental tests; (7) Review of production

line management including assembly and test processes; and (8) Review of hardware code for copyright or license violations.

11. From January 2003 to May 2003, I was a consultant for Santel Networks. I developed an optical duo-binary (ODB) encoder. Operating at 10.7 Giga bits per second (GBps), ODB reduces the spectral spread to $\frac{1}{2}$ of the ordinary NRZ format. This format allows high spectral efficiency over long distances by reducing nonlinear penalties due to narrower channel spacing and allows a higher bit rate or increases transmission distances. The project was implemented in a Xilinx FPGA running at 667 Mhz with a 10.7 GHz Mux/Demux feeding 32 LVDS streams to the FPGA. The ODB behavior was simulated in a C-coded simulation. The circuit board's highest clock speed was 10.7 Gigahertz and was modeled in HSPICE. Board level simulation was performed using NCVerilog. Several patents were applied for and the board was shown at the Optical Fiber Communication Conference & Exposition in March of 2003.

12. From March 2001 to December 2002, I was Director of Hardware, Content Networking Division for Extreme Networks, Inc. I managed a team of hardware and software engineers that developed and maintained a Layer 2-5 Content Addressable Switch. The switch was capable of L2, L3, L4 switching as well as L5 switching. In the L5 mode, the SLB used HTTP and HTML headers to make routing decisions. All routing decisions were made in real time (1 GBPs) by hardware logic

in FPGAs while a Power PC provided a user interface, configuration management and housekeeping diagnostics. Communications between the hardware elements and the PowerPC CPU was via a PCI bus. I was responsible for the system design as well as for managing the product manufacturing process.

13. From January 2000 to March 2001, I was Director of Hardware for Webstacks, Inc. (now Extreme Networks, Inc.). Extreme Networks and several venture founding partners commissioned Webstacks to build a Content Addressable Switch which would operate as a L2-5 server load balancer. This switch included content routing, load balancing, firewall and security capabilities utilizing Secure Sockets Layers (SSL). I was hired to be the system architect. My responsibilities included hiring the hardware and software engineers that would implement the server load balancer as well as set up the manufacturing process. I hired 13 ASIC, FPGA and software engineers into my department and managed them for the duration of the project. Within one year, our team had developed the product and met Extreme Networks' acquisition criteria. Extreme Networks purchased Webstacks for \$68MM cash and stock.

14. From February 1997 to December 1999, I was a consultant for Philips Semiconductor. I developed Philips Semiconductors' portion of a certification environment used by Philips Semiconductor and Microsoft to verify operation of Philips' Poseidon handheld chipset running Windows CE. This included board

development, C coding, FPGA coding and simulation as well as porting to Windows CE. Later, I supported the development of Philips' version of the MIPS 4000 with communications and storage devices to emulate a system on a chip. I also designed ASIC logic and board level hardware for a 56Kbs software modem while at Philips.

15. From September 1994 to January 1997, I was President and Founder of Minden Group, Inc. The Minden Group developed and sold several types of memory adapters and a video conferencing system. The adapters were designed to expand the memory capacity of Personal Computers while saving the customer money. Both the adapters and the video conferencing system were sold through retail stores throughout the United States and Canada. Over 250,000 memory adapters were sold at stores such as Fry's, CompUSA, Computer City and Future Shop. After developing these products, I organized and managed a team of 10 to 15 employees focused on sales, marketing, finance and production. Manufacturing of the primary components was performed through contract manufacturing in Taiwan with final assembly and distribution in the United States. Distribution included order fulfillment, contracted sales channel distribution networks and end-point retail management.

16. From August 1992 to September 1994, I was Senior Hardware Manager of RAID Product Development for MTI, Inc. In this capacity, I was responsible for architectural development of the next generation RAID 1-5 systems and for

managing the product development group. I introduced several design approaches that resulted in lower product costs as well as methods for interfacing with the company's other hierarchical storage components.

17. From April 1989 to August 1992, I was Founder and President of Spectrum Analysis, Inc., a consulting services company. I founded and operated Spectrum Analysis, Inc. with three other partners. Spectrum Analysis, Inc. specialized in electrical circuit design with emphasis on FPGA and ASIC emulation and complex PCB level designs.

18. From September 1988 to March 1989, I was Applications Manager for Quickturn Systems, Inc. Quickturn developed an ASIC emulator using Xilinx FPGAs. I was hired as Quickturn's first applications engineer, and was initially responsible for developing the training and demonstration systems for Quickturn's initial customers. Later, as the company matured, I managed the customer support team. Because this ASIC emulator worked at a fraction of clock speed, I developed a methodology of slowing board designs to a fraction of the original clock speed, (on the order of 100s of KHz) while maintaining clock and memory (DRAM) integrity.

19. From July 1987 to August 1988, I was an Applications Engineer for Telestream Corporation and was responsible for demonstration system development, training and sales support for a software based communications protocol converter product. From March 1985 to July 1987 I was a design engineer for StrataCom Inc.,

an early voice and data network equipment manufacture. StrataCom developed the IPX, a packet over leased T1 transmission and management system. I was responsible for the voice compression card as well as designing a way to include data over a primarily voice solution. The hardware I developed eventually evolved into the Frame Relay protocol. Cisco bought StrataCom in 1996.

20. From June 1983 to March 1985, I was a Design Engineer for ROLM Corporation. I was responsible for the development of a multiplex/demultiplex hardware board used in the ROLM BUS 295 telephone switch. A novel elastic buffer was used to automatically determine the length of an inter-cabinet data bus, whose length varied based on the customer's requirements. This eliminated the need for manufacturing technicians to manually adjust clock skew.

21. A more detailed account of my work experience and other qualifications is listed in my Curriculum Vitae filed as Exhibit 2023 in this matter.

III. BASES OF OPINIONS

22. In the course of conducting my analysis and forming my opinions, I have reviewed the exhibits submitted to date in this IPR, as well as the Petition, Preliminary Response, and Institution Decision.

IV. APPLICABLE LEGAL STANDARDS

A. Ordinary Skill in the Art

23. My opinions in this declaration are based on the understandings of a person of ordinary skill in the art, which I understand is sometimes referred to as an “ordinary artisan” or by the acronym “POSITA” (person of ordinary skill in the art), as of the time of the invention. For purposes of this Declaration, I have been instructed to use April 7, 2006 as the time of invention. I understand that the person of ordinary skill in the art is a hypothetical person who is presumed to have known the relevant art at the time of the invention. By “relevant,” I mean relevant to the challenged claims of the ’740 Patent.

24. I understand that, in assessing the level of skill of a person of ordinary skill in the art, one should consider the type of problems encountered in the art, the prior solutions to those problems found in the prior art references, the rapidity with which innovations are made, the sophistication of the technology, the level of education of active workers in the field, and my own experience working with those of skill in the art at the time of the invention.

25. I was at the time of invention, and am currently, one of more than ordinary skill in the art through my education and research experience. As of the date of the invention, I am very familiar with the types of problems encountered in computer networking, the types of prior art solutions described in prior art references, and the rapidity at which innovations are made. Indeed, I am very familiar with people having this level of skill in the area of computer networking and

am very familiar with commonly used technologies as Ethernet and the internet protocol / transmission control protocol (TCP/IP) suite. At the time of the invention, and since that time, I have been involved in the design and development of computer networks and in that capacity have worked with and managed teams of numerous individuals that would qualify as a POSITA.

B. Claim Construction

26. I understand that claims of the patent-at-issue in this IPR are generally interpreted according to their ordinary and customary meaning taking into consideration the so-called “intrinsic evidence” of the patent consisting of (1) the claim language; (2) the specification; and (3) the prosecution history.

27. I understand that claim terms may be explicitly defined in the patent specification, or they may be implicitly defined through consistent usage in the specification. I also understand that the scope of claim terms may be limited by statements in the specification or prosecution history where the applicant clearly disavows or disclaims subject matter.

C. Obviousness (35 U.S.C. § 103)

28. I have been informed that a patent may be invalid if the claimed invention would have been obvious at the time the invention was made to a person having ordinary skill in the art. I have been informed that the following factors must

be evaluated to determine whether Petitioner has met its burden of proof that a claimed invention is obvious:

1. The scope and content of the prior art relied upon by Petitioner;
2. The difference or differences, if any, between each claim of the patent and the prior art;
3. The level of ordinary skill in the art at the time the invention of the patent was made; and
4. Any objective indicia of non-obviousness, including, for example:
 - (1) commercial success of an embodiment; (2) a long-felt need; (3) skepticism; (4) failure by others to find the solution provided by the claimed invention; (5) copying by others of the subject matter of the claim invention; (6) unexpected results of the claimed invention; (7) acceptance of others and industry praise; and (8) licensing of the patents.

29. I have been informed that a claim is not proved obvious merely by demonstrating that each of the elements was independently known in the prior art. I have been informed that many, if not all, inventions rely on building blocks already known, and claimed inventions almost of necessity will likely be combinations of what is already known.

30. I have been informed that it is important in the obviousness inquiry to identify whether a reason existed at the time of the invention that would have

motivated a person of ordinary skill in the art in the relevant field to combine or modify the prior art references in the manner proposed by the Petitioner to arrive at the claimed invention. Put another way, a finding of obviousness should be supported by an apparent reason to combine or modify the prior art references as proposed by the Petitioner.

31. I have been informed that it is important in the obviousness inquiry that it is understood how the combination of references is supposed to work. An explanation of the operation of the combined references is often a prerequisite to showing that a person of ordinary skill in the art would have been motivated to make the proposed combination and would have had a reasonable expectation of success.

32. I have been informed that a finding of obviousness “requires the additional showing that a person of ordinary skill at the time of the invention would have selected and combined those prior art elements in the normal course of research and development to yield the claimed invention.” *Unigene Labs., Inc. v. Apotex, Inc.*, 655 F.3d 1352, 1360 (Fed. Cir. 2011). In addition, I have been informed that a person of ordinary skill in the art should have had a reasonable expectation of success in combining the references as proposed.

33. In assessing obviousness, I have been instructed to consider both the ordinary creativity and common sense of the person of ordinary skill in the art. I also understand that it is impermissible for common sense to be applied to fill gaps in

prior art that fails to teach or suggest a limitation of the claim. I also understand that the obviousness inquiry should guard against hindsight bias or hindsight reconstruction where after-the-fact reasoning is applied to combine prior art elements using the claimed invention as a template, without establishing that, as of the date of the invention, there exists a motivation to combine or apparent reason to combine the prior art as proposed.

34. In assessing obviousness, I have been instructed that, to qualify as proper prior art for an obviousness analysis, a reference must qualify as analogous art. I have been informed that a reference qualifies as analogous art with respect to the claims if it is either: (1) from the same field or endeavor as the patent; or (2) the reference is reasonably pertinent to the particular problem addressed by the invention. I have also been informed that for a reference to be reasonably pertinent, it must logically have commended itself during the ordinary course of development to an inventor's attention in considering his problem.

35. In assessing obviousness, I have also been instructed that, as noted above, secondary considerations can often be probative evidence of non-obviousness and can serve to avoid hindsight bias. I have been instructed that secondary considerations can be sufficient to overcome a prima facie case of obviousness. I have been instructed that Patent Owner can show non-obviousness if: (1) the industry praised their work; (2) their design was copied by others; (3) their design

achieved a high level of commercial success; or (4) their invention had unexpected beneficial results, for example.

V. OVERVIEW OF THE '740 PATENT AND THE STATE OF THE ART

A. Technical Background of the '740 Patent

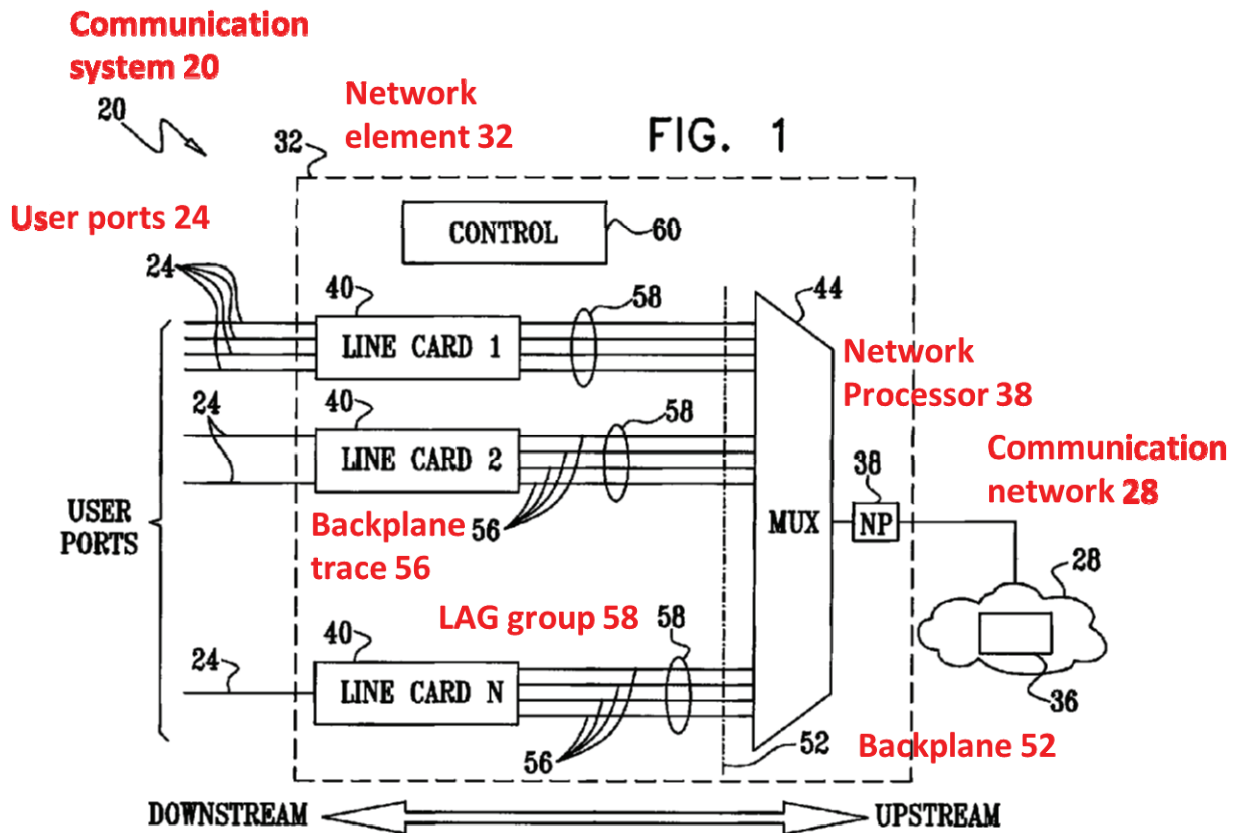
36. The general field of the '740 Patent is computer networking. The quality of service in a network depends on throughput and some guarantee of data delivery. The '740 patent ensures both elements by describing a “communication network using two or more physical links arranged in parallel, in order to provide sufficient bandwidth at a given quality-of-service (QoS) level.” (col 1: 44-47). Data frames are distributed among the parallel physical links, so as to balance the traffic load among the links.” This “allows the network element as a whole, to deliver a higher bandwidth at a given QoS or to improve QoS at a given bandwidth.”

37. The '740 Patent is directed to innovative methods and apparatuses that can perform two-way “link aggregation” in communication networks. Ex. 1001 ['740 Patent], Title, Abstract, 1:5-7. “Link aggregation (LAG) is a technique by which a group of parallel physical links between two endpoints in a data network can be joined together in a single logical link.” Ex. 1001 ['740 Patent], 1:11-13. Users may connect to a communication through “network element[s], such as ... access concentrator[s] or aggregator[s].” Ex. 1001 ['740 Patent], 1:34-36. The '740 Patent is directed to such network elements, which employ two distinct groups of physical links (e.g., ports and backplane traces, respectively), each of which may be

aggregated into a link aggregation group, for example, an “external LAG group” and a backplane trace “LAG.” Ex. 1001 [’740 Patent] 7:9-16.

38. As explained in greater detail below, the ’740 Patent improves upon prior art link aggregation implementations with methods and apparatuses in which: (i) “there is no direct relationship or connection between user ports and backplane traces” (’740 patent 1:66-2:5); and (ii) mapping a data path over the first and second groups of links of a network element (e.g., ports and backplane traces) is done in a single computation, thus “reduc[ing] hardware complexity and/or computational complexity.” (’740 patent, 6:51-65).

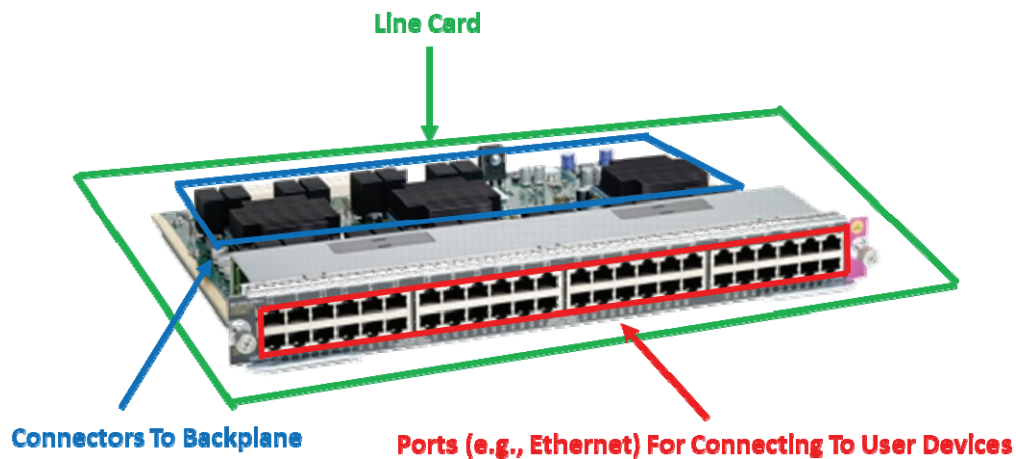
39. Figure 1 (annotated below) schematically illustrates a communication system in accordance with one embodiment of the ’740 Patent. Ex. 1001 [’740 Patent], 4:5-7:



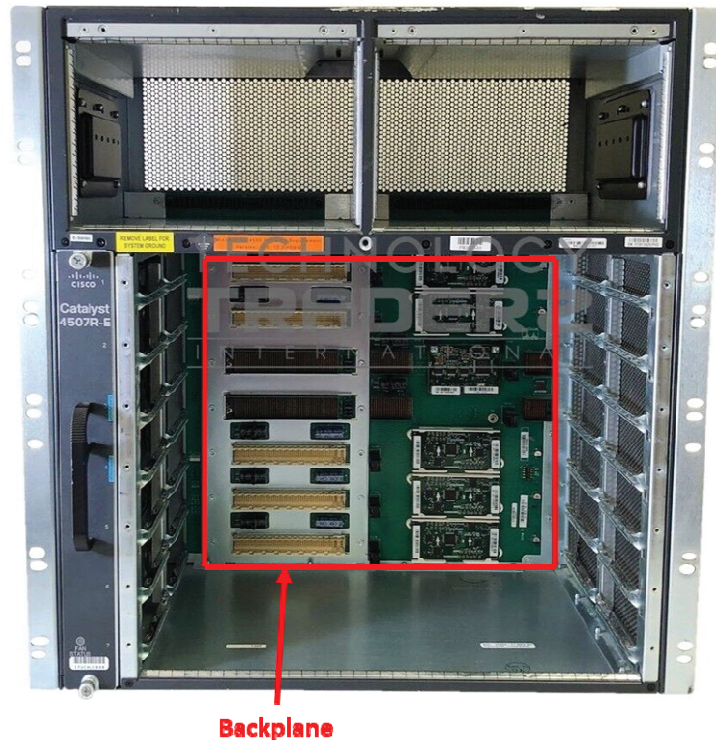
40. User ports 24 (e.g., the ports that connect to PCs or other user devices) are shown on the left. Each user port is connected to a line card 40. Ex. 1001 [’740 Patent], 4:29-30. Each line card 40 processes data frames from one or more user ports. *Id.* The line cards (also referred to as User Interface Modules or “UIMs”) are coupled to a backplane 52 through groups of backplane traces 56, such that the ports 24 may be coupled—through the line cards 40—to more than one backplane traces. Ex. 1001 [’740 Patent], 4:28-33. The ’740 patent discloses that “[b]ackplane 52 comprises physical links, such as backplane traces 56, typically in the form of printed circuit board (PCB) conductors.” Ex. 1001 [’740 Patent], 4:34-36. These traces are connected to the line cards 40, which connect to user ports. Thus, the line

cards 40 (or User Interface Modules) are each connected to one group of user ports 24 and to a second group of backplane traces 56 and serve to connect any one of the ports out of the first group of user ports 24 to any one of the backplane traces out of the group of backplane traces 56 connected to the line card.

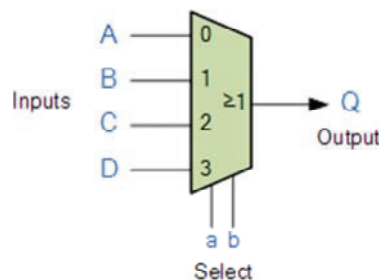
41. For reference, a real-world example of a line card is shown below with some of the elements discussed in the '740 Patent highlighted:



42. A similar example of a switch chassis containing a backplane (where the line cards connect) is shown below. Multiple line cards can be plugged into the backplane:



43. In the '740 Patent, the backplane 52 may also be connected to a multiplexer (MUX) 44. Ex. 1001 ['740 Patent], 4:38. Multiplexers receive data through a number of inputs and combine those inputs onto a single output, as seen in the example multiplexer schematic below:



44. In some embodiments of the invention claimed in the '740 Patent, in the upstream direction (i.e., from user ports 24 to communication network 28), the multiplexer combines the frames received separately from each backplane trace onto

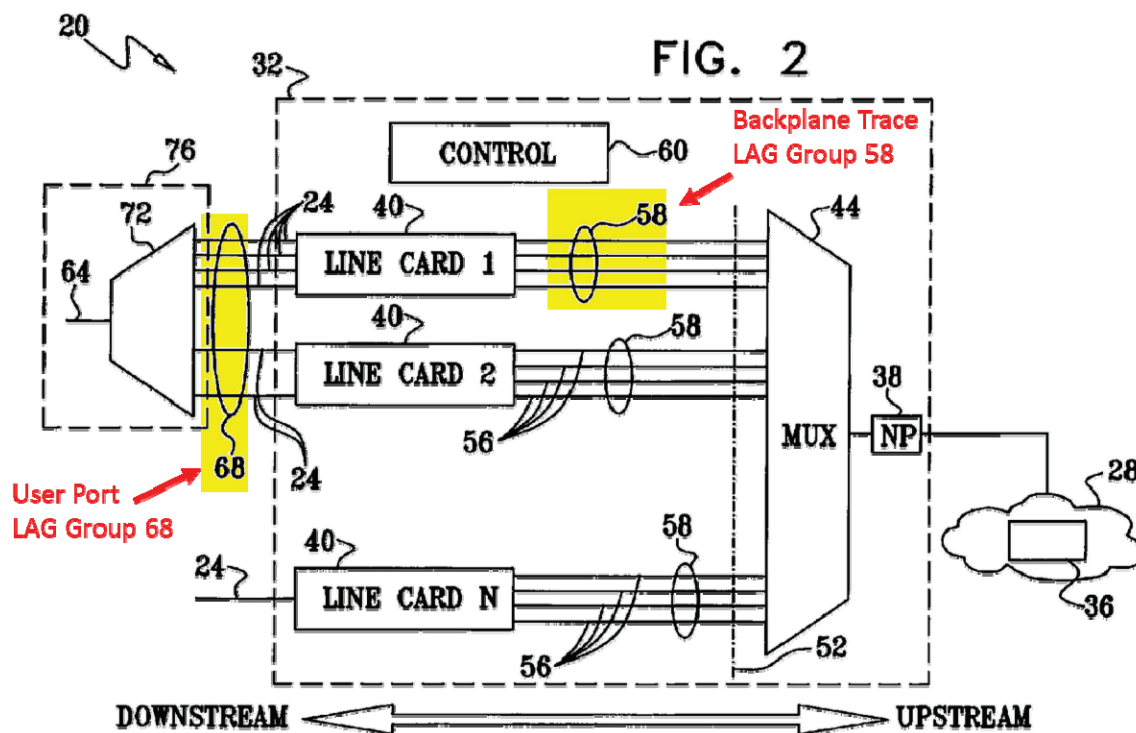
a single upstream output that is sent to network processor 38 and then further upstream to node 36 of communication network 28. Ex. 1001 ['740 Patent], 4:39-42. “In the downstream direction, network processor 38 of network element 32 accepts a downstream input comprising downstream frames addressed to user ports 24 from node 36 through connection 48” and “MUX 44 sends each frame to the appropriate user port via the appropriate line-card.” Ex. 1001 ['740 Patent], 4:43-47.

45. In order to increase bandwidth and quality of service, the '740 Patent discloses link aggregation for one or both a first and second group of physical links. Ex. 1001 ['740 Patent], 2:47-49 (“In yet another embodiment, at least one of the first and second groups of physical links include an Ethernet link aggregation (LAG) group.”). These first and second LAG groups may comprise user ports and backplane traces, respectively. Ex. 1001 ['740 Patent], 2:5-8 (“In some embodiments, two or more physical user ports are aggregated into a LAG group external to the network element, so as to form an aggregated user port having a higher bandwidth.”); 2:44-46 (“In another embodiment, the second physical links include backplane traces formed on a backplane to which the one or more interface modules are coupled.”).

46. Further, the frames are distributed among different ports in a first group of ports and/or different backplane traces in a second group of backplane traces in order to balance the load, thereby increasing bandwidth and quality of service across

the network. “The frames to and from the aggregated user port are distributed among the physical user ports of the external LAG group to balance the load and enable higher bandwidth and [quality of service].” Ex. 1001 [’740 Patent], 2:8-11.

47. An example of these two separate LAG groups is shown below with respect to annotated Fig. 2:



48. The ’740 Patent discusses that “[i]n general, the processing of [] frames in network element 32 comprises two consecutive mapping operations.” Ex. 1001 [’740 Patent], 6:54-55. “First, each frame is mapped to one of user ports 24 in external LAG group 68.” Ex. 1001 [’740 Patent], 6:54-55. The user port 24 corresponds to a single line card, so “[d]etermining the user port implicitly determines through which line card 40 the frame will pass.” Ex. 1001 [’740 Patent],

6:57-58. “Then, the same frame is mapped to one of backplane traces 56 in the appropriate LAG group 58.” Ex. 1001 [’740 Patent], 6:58-60.

49. The ’740 Patent teaches that the load-balancing operation can be performed with suitable mapping functions, including, for example, hashing functions. Ex. 1001 [’740 Patent], 1:60-62, 5:22-24, 7:17-24. “The mapping function distributes the frames among the different backplane traces so as to balance the load between the traces.” Ex. 1001 [’740 Patent], 5:25-27. “[T]he mapping function hashes one or more frame attributes, such as header fields of the Ethernet frame, to produce a hashing key. The hashing key corresponds to an index of the backplane trace over which the frame is to be sent.” Ex. 1001 [’740 Patent], 5:27-31.

50. Examples of mapping functions are discussed in the specification, where, for example, mapping functions index both the user port and backplane trace onto four bits by using two bits for the port index and two bits for the trace index. Ex. 1001 [’740 Patent], 7:60-8:2 (“the four bit mapping index is partitioned so that two bits encode the user port and two bits encode the backplane trace.”). So, for example, in a LAG comprised of four ports and four backplane traces, each of the four ports is mapped to two bits and each of the four backplane traces is mapped to two bits. Thus, a frame may be transmitted over several different paths corresponding to the different combinations of first links (e.g., ports) and second links (e.g., backplane traces) onto which that frame may be mapped.

B. Petitioner's Cited References

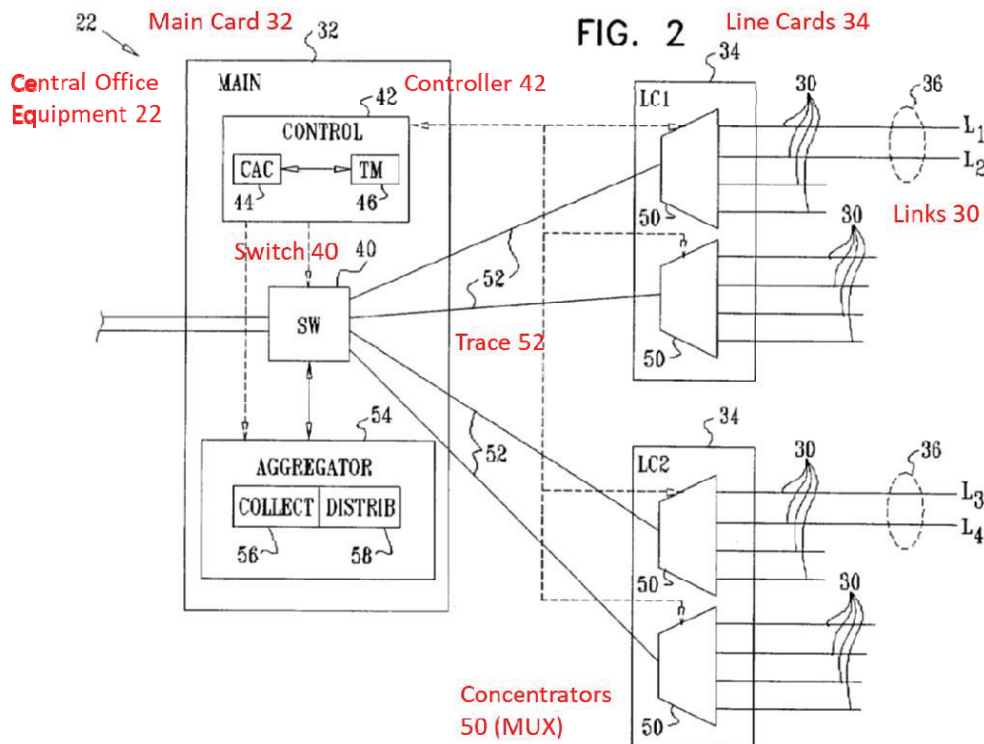
51. The Petition asserts four grounds, as shown below:

Grounds	Claims	Basis
#1	1-31	35 U.S.C. § 103 (Pre-AIA) over Bruckman
#2	1-31	35 U.S.C. § 103 (Pre-AIA) over Bruckman and Basso
#3	11 and 26	35 U.S.C. § 103 (Pre-AIA) over Bruckman and Holdsworth
#4	11 and 26	35 U.S.C. § 103 (Pre-AIA) over Bruckman, Basso, and Holdsworth

Pet., 21. In each ground, Bruckman is the primary reference.

1. Bruckman (Ex. 1005)

52. Bruckman (Pat. Publ. No. US2004/0228278) is directed to “Bandwidth Allocation for Link Aggregation.” Ex. 1005 [Bruckman], Title. Bruckman Fig. 2 (annotated below) is a block diagram that schematically shows details of communication equipment with link aggregation capability in accordance with one embodiment of Bruckman. Ex. 1005 [Bruckman], ¶[0045].

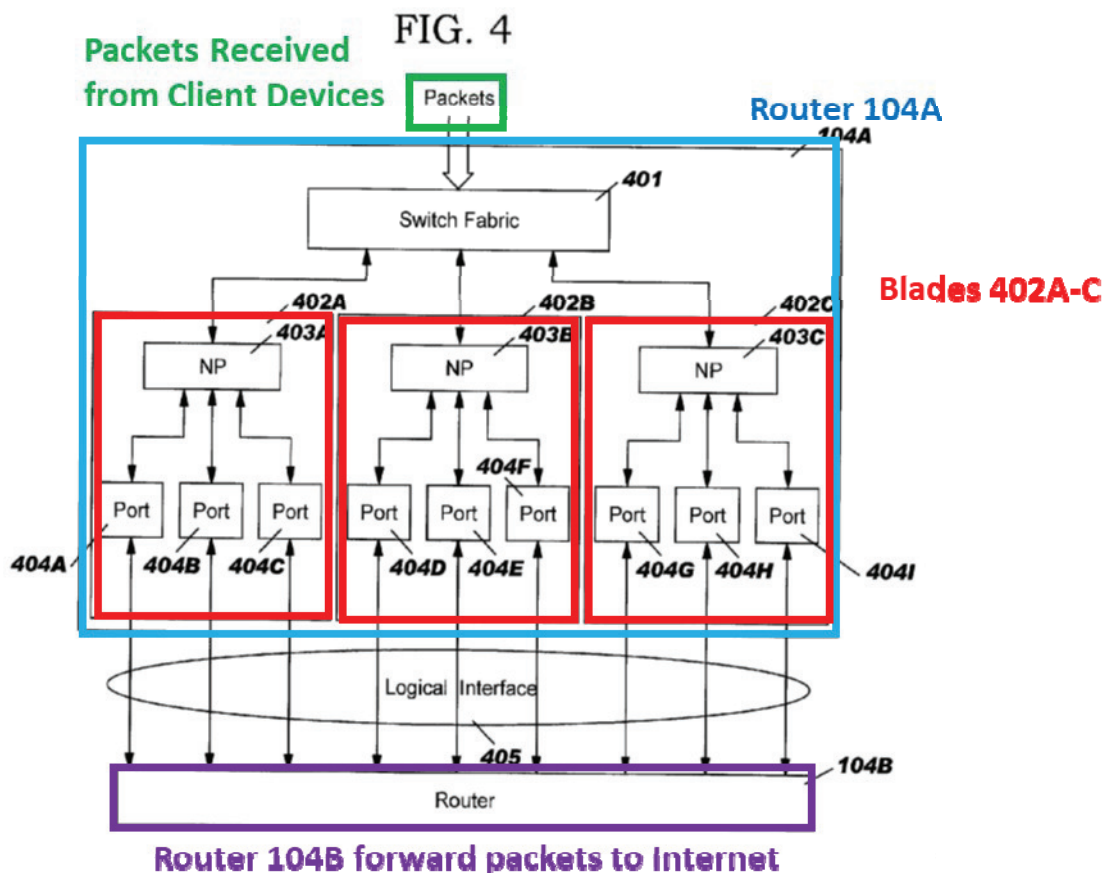


53. In Bruckman, switch 40 “switches traffic to and from line cards 34” via traces 52. Ex. 1005 [Bruckman], ¶[0049]. “The operation of switch 40 is managed by a controller 42.” *Id.* “Each line card 34 comprises one or more concentrators 50, which comprise multiple ports that serve respective links 30.” *Id.*, ¶[0056]. Concentrators 50 “multiplex data traffic between links 30 and traces 52.” *Id.* That is, as a packet passes over a trace 52, it arrives at the multiplexer on a concentrator 50, which determines which link 30 of the links connected to that concentrator should forward the packet. Links 30 are connected to customer nodes. *Id.*, ¶[0047]. “[D]istributor 58 determines the link over which to send each frame based on information in the frame header,”. *Id.*, ¶[0058]. Since each link has only one

corresponding trace election of a specific link 30 determines a specific trace 52 to be used—that is each link 30 has one trace 52 that is always associated with it.

2. Basso (Ex. 1006)

54. Basso (Pat. Pub. US2003/0210688) is directed to “logically grouping physical ports into logical interfaces to expand bandwidth.” Ex. 1006 [Basso], Title. Basso Fig. 4 (annotated below) illustrates an embodiment of a router with logical groupings of its physical ports. Ex. 1006 [Basso], ¶[0018]:



55. In Basso Fig. 4, packets are received from client devices at switch fabric 401. Ex. 1006 [Basso], ¶[0030]. “[N]etwork processor 403 may be configured

to receive a packet of data from switch fabric 401.” Ex. 1006 [Basso], ¶[0031].

“Network processor 403 may then transmit the processed packet to a particular network device” such as router 104B, “through a port 404 connected to that network device.” *Id.*

56. However, “the rate at which the processed packets are transmitted is limited to the bandwidth of the physical connection between the port [e.g., 404A-I] and the network device [e.g., router 104B].” Ex. 1006 [Basso], ¶[0032]. Basso discloses transmitting packets of data “across multiple physical ports to a particular network device from a particular network processor” to increase the bandwidth available. Ex. 1006 [Basso], ¶[0033]. Thus, Basso discloses that a particular network processor chooses one of the physical ports attached to it to transmit packets of data.

57. Basso teaches that hash values may be used to identify “an appropriate blade/port combination.” Ex. 1006 [Basso], ¶[0012]. These blade/port combinations are stored as entries in a table with each port having a corresponding blade assigned to it. Ex. 1006 [Basso], ¶[0043]. That is, each blade has the same ports integrated onto it. As shown in the figure above, the network processors are part of the blades.

3. Holdsworth (Ex. 1007)

58. Holdsworth appears to be excerpted portions of the book “Digital Logic Design” by Brian Holdsworth and Clive Woods. Ex. 1007 [Holdsworth]. The

excerpted portions comprise several single, non-sequential pages that purport to discuss multiplexers and decoders. Id., 3-7.

C. Level of Ordinary Skill

59. The Petition and Petitioner's expert assert:

A Person of Ordinary Skill in The Art ("POSITA") in April 2006 would have had a working knowledge of computer networking, including such commonly used technologies as Ethernet and the internet protocol / transmission control protocol (TCP/IP) suite. A POSITA would have had a bachelor's degree in electrical engineering, or an equivalent, and two years of professional experience in the field of communication networks, including link aggregation in communication networks. Lack of professional experience can be remedied by additional education, and vice versa.

Pet., 18. I do not dispute Petitioner's level of ordinary skill for purposes of this declaration.

VI. CLAIM CONSTRUCTION

A. "Selecting ... A First Physical Link Out Of The First Group And A Second Physical Link Out Of The Second Group"

60. Claim 1 requires "selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group." Ex. 1001 ['740 Patent], claim 1. Other

independent claims recite similar limitations,¹ all of which require the same substantive elements: (i) two selections, of a first physical link and of a second physical link, (ii) that these two selections be performed in a single computation, and (iii) that the two selections be made based on at least one of the frame attributes.

61. In the Decision on Institution, the Board preliminarily found that “Claim 1 [] does not require two independent or distinct selections” on the basis that there is no temporal requirement in the claims. DI, 30. In my opinion, there is no temporal requirement in claim 1 of the ’740 Patent. However, in my opinion, claim 1 does require two distinct selections.

62. As discussed below, the claim language requires *two* selections from two different groups of links, and, consistent with the claim language, the specification excludes configurations where the user port is fixedly assigned to a

¹ The limitation appears verbatim in independent claims 4, 5, and 13. It also appears in conjunction with a control module limitation in claims 17, 19, 20, and 28. The claims requiring a control module are addressed separately below with respect to the requirement of a control module; but the requirement for selecting a first and second link in a single computation is otherwise substantially the same as recited in claims 1, 4, 5, and 13.

specific backplane trace. Thus, consistent with the claim language and specification, the term “selecting ... a first physical link out of the first group and a second physical link out of the second group” should be construed as “selecting ... a first physical link out of the first group and selecting a second physical link out of the second group, wherein the first physical link is not fixedly assigned to the second physical link.”

63. I understand that the language of the claims, as understood by a POSITA, is of primary importance in claim construction. This limitation expressly requires two selections from two different groups (i.e., “selecting ... a first physical link out of the first group **and** a second physical link out of the second group”). The claim term “selecting” clearly modifies both the “first physical link out of the first group” and the “second physical link out of the second group.” Ex. 1001 [’740 Patent], claim 1. Thus, two selections are required.

64. Further, there must be two selections because two links are “selected” from two different “groups”: a first group of links and a second group of links. Ex. 1001 [’740 Patent], claim 1. This means both selections must select from a group consisting of a plurality of links. If there is only one predetermined second physical link that must be used because (as in Bruckman) each first physical link is connected to only one second physical link, there is no such selection. This is further reinforced by the claims’ requirement for a “second group” that is made up of

“second physical links.” The second group must include a plurality of second physical links to choose from. Ex. 1001 [’740 Patent], claim 1.

65. I understand the specification is also important to claim construction and informs how a POSITA would interpret the claims. The specification is directed entirely to embodiments in which two discrete selections of physical links are performed in a “single computation.” A POSITA reviewing the specification would understand that it is distinguishing systems like Bruckman—where a port is selected and each port is directly connected to a single trace.

66. I have been informed that the specification may clarify the meaning of the claims and can even disavow certain interpretations of the claims. In my opinion, the claims are clearly directed to two distinct selections of physical links (e.g., the first links do not have a fixed assignment to the second links). However, to the extent the claims could be interpreted otherwise, the ’740 Patent disavows prior art systems where a single port is selected that is “fixedly assigned to a specific backplane trace.” First, the summary of the invention states that a distinguishing characteristic of the claimed invention is that, unlike the prior art where “each user port is fixedly assigned to a specific backplane trace,” the ports in the ’740 Patent (i.e., an embodiment of the first links) are not directly assigned to any particular backplane trace (i.e., an embodiment of the second links):

Unlike some known network element configurations, in which each user port is fixedly assigned to a specific backplane trace, the load balancing operation in embodiments of the present invention enables statistical multiplexing of the frames, in which there is no direct relationship or connection between user ports and backplane traces.

Ex. 1001 [’740 Patent], 1:66-2:4. In my opinion, a POSITA would understand from this passage that the invention of the ’740 Patent improves upon these “known network element configurations” where there is a “direct relationship or connection between user ports and backplane traces” by providing a selection of backplane traces that is not determined by the specific port over which data is sent.

67. Second, the specification teaches that the claimed embodiments support various different forms of load balancing (e.g., ’740 patent at 5:9-10, teaching that “any other load balancing criterion can be used”) as a result of which “there is no pre-assigned relationship or connection between any given user port 24 and a specific backplane trace, as in some conventional network elements.” 5:17-19. Consistent with the specification, the dependent claims expressly require “balancing a frame data rate among at least some of the first and second physical links” (*see, e.g., claim 7*), *i.e.*, load balancing that is applied to some of the first links, some of the second links, or some of the first and second links. Ex1001 [’740 Patent], 5:19-21. Performing such load balancing (*i.e.*, between different permutations of ports and traces) consistent with the claims and specification requires a network element

in which each of the ports is assigned to more than one backplane traces, such that the selection of a port does not also determine the exact trace over which data will be transmitted. Put differently, the “frame data rate” cannot be balanced among second physical links if (like in Bruckman) there is only one second physical link available.

68. Third, the specification describes a control module that performs two selections of links in the claimed network element—e.g., of ports and of traces—and consists of line cards that serve ports and traces with no direct relationship. *See* 5:59-6:14. In particular, the patent describes a control module that does the following:

First, for each Ethernet frame, module 60 determines the appropriate line card to which the frame should be sent, depending on the destination user port.

Ex. 1001 [’740 Patent], 5:60-63.

Then, within the backplane traces belonging to the LAG group of the appropriate line card, module 60 selects a particular trace and controls MUX 44 to send the frame over the selected trace.

Ex. 1001 [’740 Patent], 5:63-66.

69. Thus, the control module disclosed in the patents (and claimed in certain of the independent claims) performs two discrete selections: one of a port (i.e., a first link) and one of a backplane trace (i.e., a second link). Ex1001 [’740 Patent], 5:60-66, Fig. 1 (showing multiple backplane traces 56 and multiple user

ports 24 connected to the same line card 40). To permit these two discrete selections, the ports (e.g., the input lines to the interface module in the upstream direction) must not have a predetermined relationship with the backplane traces (e.g., the output lines coming out of the interface module in the upstream direction).

70. Fourth, in the downstream direction, the patent discloses “two mapping operations” that can be performed in a “a single combined mapping operation.” Ex1001 [’740 Patent], 6:60-65. A first mapping operation (i.e., first selection) determines the port and line card through which a frame will pass, and a second mapping operation (i.e., second selection) determines the particular trace through which the frames will be transmitted:

In the system configuration of FIG. 2, consider the downstream frames arriving from network 28, via network processor 38, to multiplexer 44 and addressed to aggregated user port 64. In general, the processing of these frames in network element 32 comprises two consecutive mapping operations. First, each frame is mapped to one of user ports 24 in external LAG group 68. Determining the user port implicitly determines through which line card 40 the frame will pass. Then, the same frame is mapped to one of backplane traces 56 in the appropriate LAG group 58 that serves the selected line card.

Ex. 1001 [’740 Patent], 6:51-60.

71. Note that the above passage of the '740 Patent distinguishes between the “implicit[] determine[ation]” of a line card by selecting a port 24 and the second selection of “one of backplane traces 56.” *Id.* A POSITA would understand this disclosure, consistent with the express language of element 1.6 (which requires “selecting a first physical link out of the first group and a second physical link out of the second group”), to require the selection of two links (e.g., a port and a backplane trace) that are discrete from one another. This cannot occur if the port is fixedly assigned to the backplane trace.

72. Fifth, the patent discloses performing both selections in a single computation rather than two computations because selecting two links in two computations adds undesirable “complexity:”

In some embodiments, in order to reduce the hardware complexity and/or computational complexity of network element 32, control module 60 performs a single combined mapping operation that combines the two mapping operations described above.

Ex. 1001 ['740 Patent], 6:61-65. This is further evidence that in the claims of the '740 Patent, selecting a first link does not also determine the second link; rather, the second link must also be selected in a separate selection, the added complexity of which is minimized by performing both selections in a single computation by combining two mapping operations.

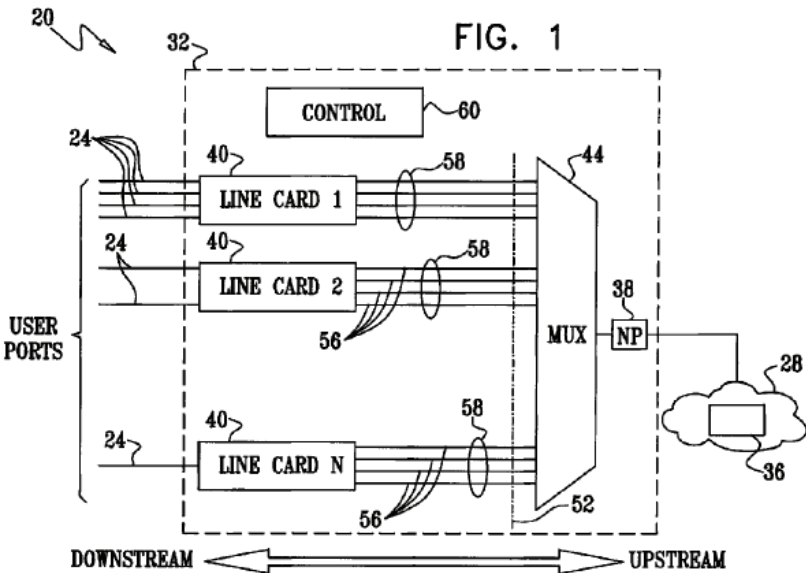
73. The details of one embodiment of this single computation also illustrate that two selections must be performed. The '740 Patent teaches that a single combined mapping operation can be performed, by way of example, with a hashing function that selects “both the backplane trace 56 over which the frame is to be sent to one of line cards 40, and the user port 24 to be used within external LAG group 68.” Ex. 1001 [’740 Patent], 6:66-7:3. The disclosed hashing function is thus one way of selecting both a first and a second physical link in a single computation.

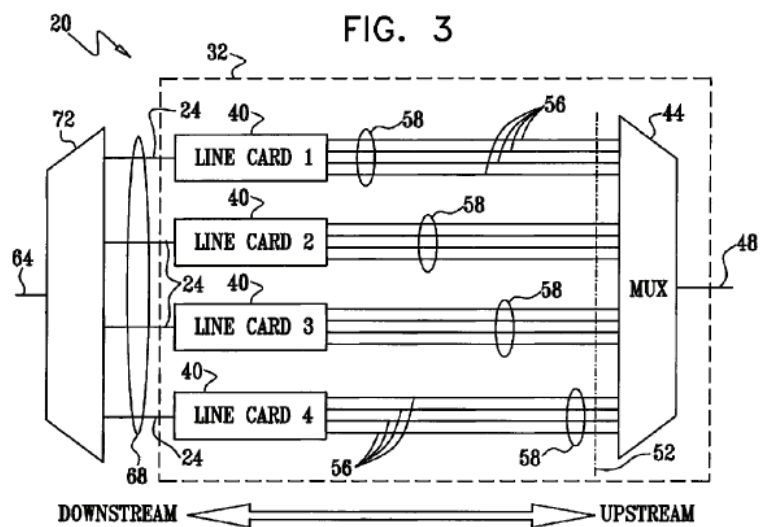
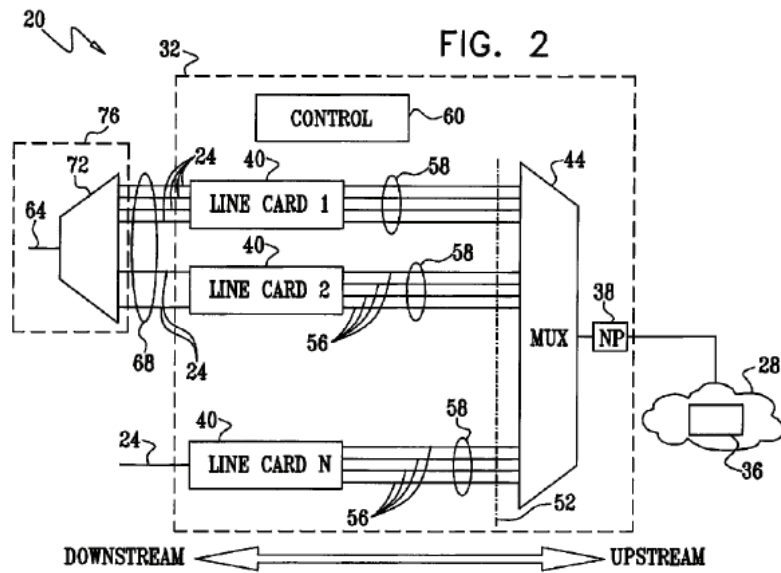
74. In one embodiment, the hashing function utilizes a hashing size parameter N_{bpow} , with $N_{bpow} = N_{nextp} \times N_{bpt}$ that corresponds to the product of the number of user ports (“ N_{nextp} ”) to the number of backplane traces (“ N_{bpt} ”). Ex. 1001 [’740 Patent], 7:25-30. This hashing parameter accounts for every path (corresponding to a mapping of ports onto backplane traces) over which a frame may be transmitted.

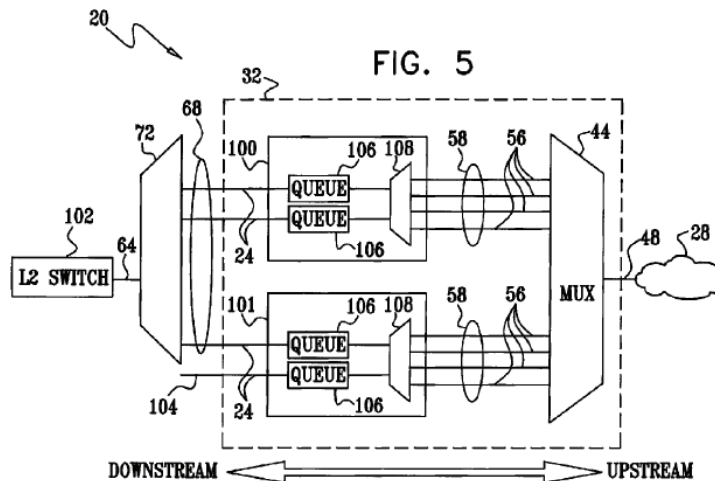
75. A POSITA would understand from the disclosure of a parameter which multiplies the number of ports by the number of backplane traces that the number and selection of traces over which data may be sent is not determined by the specific port receiving incoming data. If each port directly corresponded to only one trace (as in the prior art), the parameter N_{bpow} would simply equal N_{nextp} because multiplying N_{nextp} by N_{bpt} would give an erroneous result. In other words, if the selection of a port also determined the selection of a trace then it would not make

sense to use a hashing parameter based on all the potential paths that result from mapping multiple inputs (e.g., ports) onto multiple potential outputs (e.g., backplane traces) of the claimed interface module. Instead, the hashing parameter would simply select a port.

76. Sixth, consistent with the claim language and the specification, each of the figures in the '740 patent depicts line cards in which the ports (24) correspond to multiple traces (56):







77. As can be seen in the figures and discussion above, there is no embodiment in which the ports (24) directly correspond to only a single backplane trace (56). In every instance, the selection of a backplane trace is not determined by the selection of a port. Thus, a POSITA would understand that in the '740 Patent, a backplane trace is not determined by the selection of a port.

78. The specification clearly and consistently distinguishes over systems where the user port is “fixedly assigned” to a specific backplane trace. A POSITA would understand from the claim language, the specification, and the figures in the ’740 Patent that the “selection” limitation requires that the selection of the second physical link from the second group is not determined by the first physical link from the first group (or that the first physical link is not fixedly assigned to the second physical link).

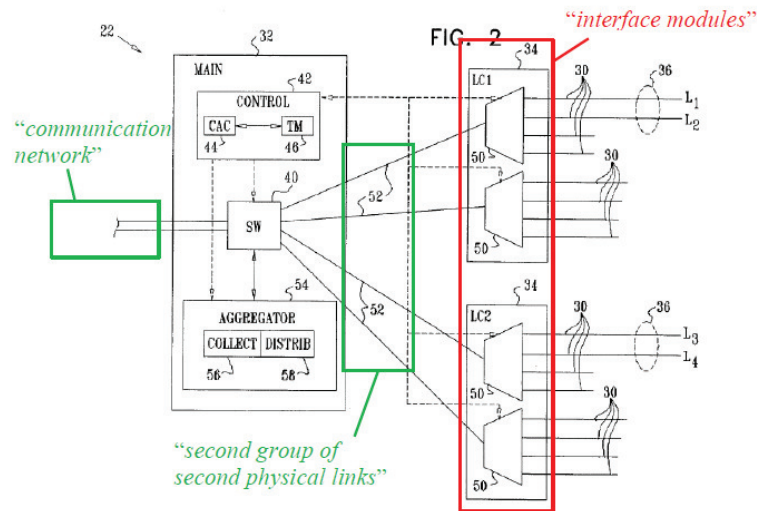
VII. THE ASSERTED PRIOR ART DOES NOT TEACH OR SUGGEST THE CHALLENGED CLAIMS

A. Neither Bruckman Nor Basso Teach or Suggest “Coupling Each Of The One or More Interface Modules To A Communication Network Using A Second Group Of Second Physical Links Arranged In Parallel”

79. Limitation 1.3 requires “coupling each of the one or more interface modules to a communication network using a second group of second physical links arranged in parallel.” Independent claims 4, 5, 13, 14, 15, 17, 19, 20 and 28-30 each include the same or similar language requiring “a second group of second physical links” (or a “plurality of backplane traces”) arranged in parallel. Thus, this argument applies to each independent claim and, by extension, the claims that depend therefrom.

80. Petitioner asserts that Bruckman discloses “line cards 34 (‘one or more interface modules’))” that are coupled to the core network with a “set of parallel traces 52 (‘a second group of second physical links arranged in parallel’).” Pet., 37. I disagree. Limitation 1.3 expressly requires coupling the interface module (the line cards) to the core network using a second group of “physical links arranged in parallel.” Ex1001 [’740 Patent], 11:4-6 Bruckman fails to disclose this limitation, however, because the traces (52) in the Bruckman apparatus—to which Petitioner points as the second group of physical links—are not *arranged in parallel*.

81. As shown in Petitioner's annotated Figure 2 from Bruckman (below), each of the traces 52 is coupled to different endpoints, in particular, a switching core 40 (on the left) and a concentrators 50 (on the right):



Ex.1005, Fig. 2 (annotated); Ex.1003, ¶67.

A POSITA would easily recognize that each of the traces corresponds to a different set of links 30 because each trace is connected to a different concentrator 50. Each concentrator 50 correspondingly has a different set of links 30 attached.

82. As explained in detail below, a POSITA would understand that this arrangement of traces 52 in Bruckman is not an arrangement in parallel, as required by limitation 1.3, because: (i) the relevant endpoints for the traces 52 in the context of the internal layout of the Bruckman apparatus are the switching core 40 and each of the concentrators 50, and (ii) the traces share only one common relevant endpoint (the switching core 40), while the second relevant endpoint (*i.e.*, each of the concentrators) is different for each trace.

83. A POSITA would understand that the claimed parallel arrangement of the second physical links requires that these links start and end at the same relevant endpoints. For example, The IEEE 100 Authoritative Dictionary of IEEE Standards Terms, copyright 2000, defines ‘parallel’ for software as “Pertaining to the simultaneous transfer, occurrence or processing of the individual parts of a whole... using separate facilities for the various parts.” Ex2031 [IEEE Dictionary], 4. Processing individual parts of a whole requires that the parallel paths are connected to a common start point where they are subdivided, and a common end point where the individual parts of the whole are recombined. For example in a communications circuit transferring information, such as in TCP/IP, the individual packets of the TCP connection can be divided into separate parallel paths and then recombined at the TCP connection at a endpoint. TCP is designed to accommodate parallel circuits as the protocol includes a packet sequence ID. The end point receives the IP packets and orders them in accordance to the sequence ID.

84. In a simplified example used only to illustrate the concept of links arranged in parallel, parallel paths in a two terminal analog electronics circuit allow a subset of current to flow through each path. In the figure below, starting at the bottom, the entire electrical current from the 120v battery is divided among the

parallel paths as current subsets I_1 , I_2 , I_3 . At the top of the circuit the current from each branch is recombined into the total current I_T ². In the context of networking, a POSITA would understand that parallel links must share the same *relevant* endpoints (e.g., components that enable parallel transmission paths).

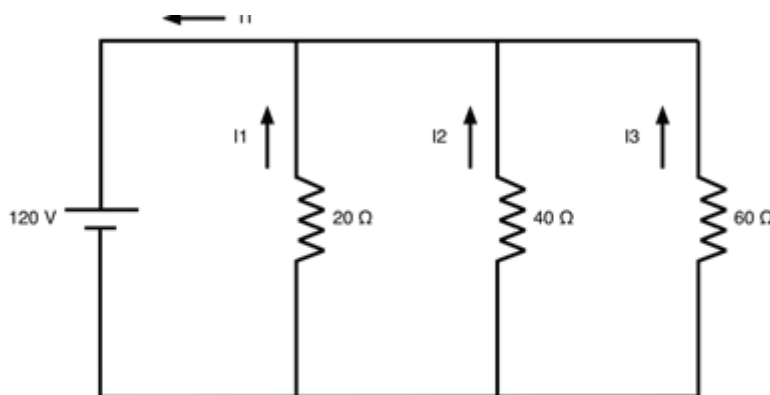


Figure 20. Parallel circuit current flow

85. In the context of the '740 patent, the relevant endpoints are those which would enable a principal innovation in the network element architecture disclosed in the '740 patent, in particular, flexible mapping with selectable second links and selectable first links, where the first links are not fixedly assigned to the second links. This is described in the specification as a distinction over the prior art:

Unlike some known network element configurations, in which each user port is fixedly assigned to a specific backplane trace, the

² <https://pressbooks.bccampus.ca/basicelectricity/chapter/ground/>

load balancing operation in embodiments of the present invention enables statistical multiplexing of the frames, in which there is no direct relationship or connection between user ports and backplane traces.

Ex. 1001 [’740 Patent], 1:66-2:4.

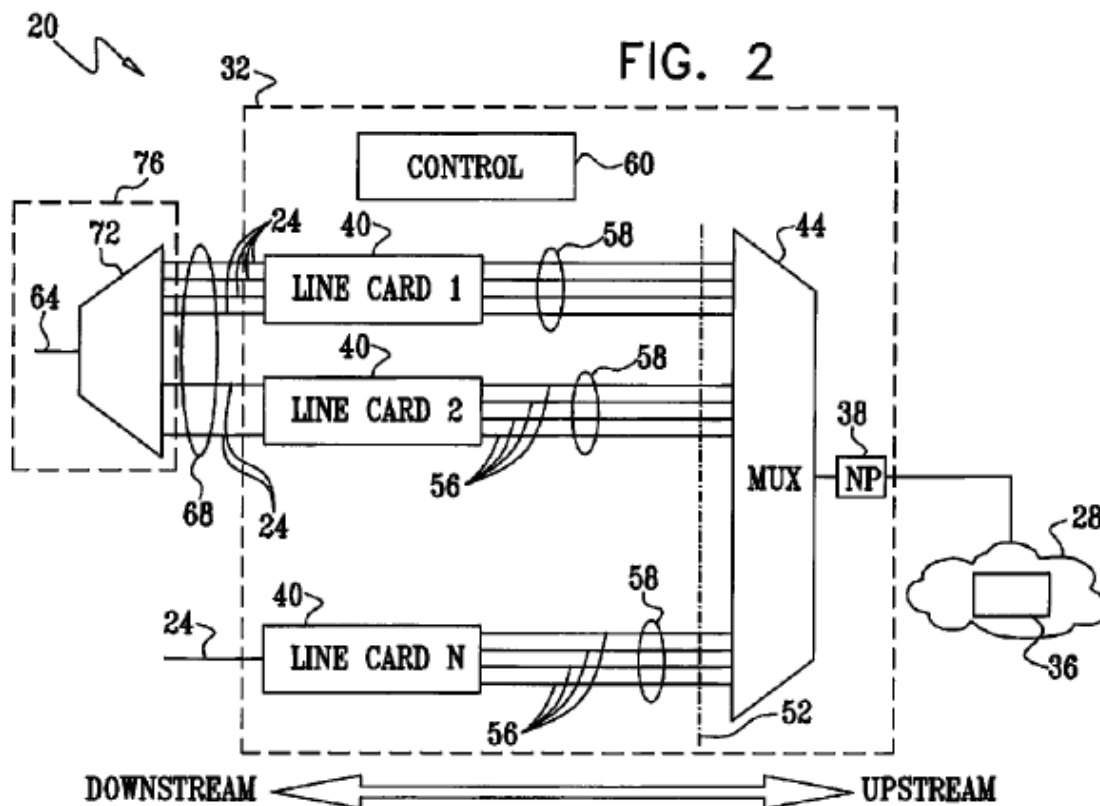
Each LAG group 58 is considered by the relevant line card and by multiplexer 44 to be a single logical link having an aggregated bandwidth (i.e., capacity) equal to the sum of the bandwidths of the individual backplane traces in the group. As a result, there is no pre-assigned relationship or connection between any given user port 24 and a specific backplane trace 56, as in some conventional network elements. Ethernet frames are statistically multiplexed so as to balance the load among the backplane traces.

Id., 5:13-21.

Each line card may serve any number of user ports 24 and any number of backplane traces 56. In general, there need not be a direct relation between the number of user ports and the number of backplane traces.

Id., 6:7-10. For this structural feature to be possible, the first and second physical links must terminate at endpoints—e.g., interface modules—that permit the first physical links to connect directly to more than one second physical links.

86. This understanding is consistent with every embodiment depicted in the figures of the '740 patent, which show that the first links (e.g., ports) all connect (e.g., through line cards) to more than one second physical links (e.g., backplane traces). For example, '740 Patent Figure 2 below shows interface modules (line cards 40) that are connected to more than one trace 56 such that either no particular port 24 is associated to only one trace 56:



87. Moreover, a POSITA would understand, e.g., from Fig. 2 above, that as to each line card (e.g., line card 1), the backplane traces 56 are arranged in parallel because (i) they are depicted as parallel physical connections and, critically, (ii) they have the same relevant endpoints: MUX 44 and line card 1. The reason that a

POSITA would understand these endpoints to be relevant is because in the context of the internal architecture of the claimed network element, the MUX 44 and the line card 1 permit the backplane traces to connect to the same set of ports (to the left of the figure or downstream) and the same core network (to the right of the figure or upstream). The same holds true for each of the other groups of backplane traces 58 shown in the same figure.

88. Petitioner's expert, Dr. Houh, testified to this very point, i.e., that that a POSITA would understand these traces to be parallel because they are shown as such in the drawing *and* because they have the *same* starting points and endpoints (*i.e.*, the same multiplexer, and the same sets of ports, via the same line cards):

Q. Now, let me ask you this, Dr. Houh. This top group of backplane traces that connect on the one hand to line card 1 and on the other hand to MUX 44, is this set of backplane traces arranged in parallel?

A. I mean, certainly the figure suggests that these are -- are parallel traces.

Q. What in the figure suggests to you that these are parallel traces?

A. Well, there are four separate lines, and they're -- they're -- they're parallel lines as drawn on -- in the figure.

Q. And the fact that they're parallel lines as drawn would lead you to believe that these are parallel traces. Correct?

A. I mean, coupled with the context of the specification, I mean, I -- I think, you know, the figures are read and described to the -- the POSITA reviewing the patent.

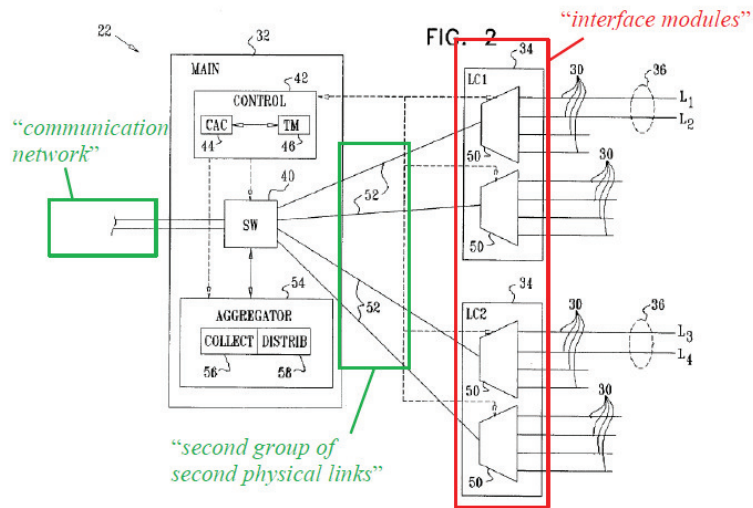
Q. Does the fact that these four backplane traces all start at the same line card and end at the same multiplexer also suggest that these are parallel backplane traces?

A. I think it's certainly consistent with things that are described in the -- in the specification as well.

Ex2026 [Houh Dep. Tr.], 61:14-62:14.

89. A POSITA would understand that in the context of the claims, providing the backplane traces 56 as parallel physical links enables a network element “in which there is no direct relationship or connection between user ports and backplane traces.” And a POSITA would understand that traces that each lead to a different sets of ports, such that the ports (or first physical links) in a group can only directly connect to a single trace, are not arranged in parallel. Ex2028 [All About Circuits], 2 (“In a parallel circuit, all components share the same electrical nodes.”); Ex2032 [Basic Electricity], 1 (“A parallel circuit is constructed by connecting the terminals of all the individual load devices”).

90. In contrast to the '740 patent, Bruckman discloses a network element in which the traces 52 are (i) not drawn in parallel and (ii) all connect to different concentrators 50, each of which is associated with different sets of physical links 30:



Ex.1005, Fig. 2 (annotated); Ex.1003, ¶67.

Each of the traces 52 is going to a different concentrator 50, and from there to a *different* set of physical links 30 that are connected to different customer nodes (i.e., different endpoints). Dr. Houh correctly testified that traces “going to different places” would not be understood by a POSITA as parallel:

Q. If these backplane traces had different starting and ending points, would that suggest to you that they are parallel traces?

A. I don't think that alone would -- would -- oh, wait. So you're saying if the -- if the trace had different starting points and end points? I mean, they still could be parallel as laid out on a board, but if the communications are going to different places, then -- then -- then if

communications over those traces are going to different places, I don't think that's what is thought of as -- as -- as parallel links or traces, or links.

Q. And when you say "that is thought of," you mean by a person of ordinary skill in the art?

A. Yes.

Ex2026 [Houh Dep. Tr.], 62:15-63:6. Dr. Houh's testimony confirms my opinion that it would have been evident to a POSITA from Bruckman Fig. 2 that Bruckman's traces go to different places (*i.e.*, different internal components that ultimately connect to different customer nodes) and are thus not parallel in the context of Bruckman's internal layout. Bruckman thus fails to disclose this limitation; and Petitioner's challenge fails on this basis alone.

91. Petitioner and Dr. Houh have not shown that the requirement for a parallel arrangement is met. They point to a disclosure in Bruckman referring to link aggregation as follows: "link aggregation is a technique by which a group of parallel physical links between two endpoints in a data network can be joined together into a single logical link" (Pet., 35; Ex. 1003 [Houh Decl.], ¶61 (quoting Ex. 1005 [Bruckman], ¶[0002])). They appear to contend that because the traces can be part of a link aggregation group in some embodiments, Bruckman renders a parallel

arrangement of traces (or second physical links) obvious. In my opinion, this is incorrect.

92. First, though the traces in Bruckman may be part of a logical link that consists of multiple traces and links, the structural arrangement of the traces as *physical links* is simply not in parallel. The claim language requires that each of the second physical links connect an interface module to the core network, and that the same interface module must be connected to the same group of the first physical links as all the second connected to that interface module. A POSITA would understand that the relevant endpoints for determining whether those second links are parallel are those that connect the links to the core network and to the first physical links; and that those endpoints must be shared in common for the second physical links to be arranged in parallel. Bruckman fails to disclose such an arrangement, and a POSITA would understand that Bruckman's traces share a first endpoint (the switching core 40 that connects the traces to the core network) **but not** a second endpoint (since each trace connects to a different concentrator for which links 30 are inputs/outputs and a single trace 52 is an output/input). Accordingly, because Bruckman's traces all connect to different concentrator endpoints (or in Dr. Houh's words, go to "different places"), a POSITA would understand that they are not parallel physical links.

93. Second, though Dr. Houh points to Bruckman’s disclosure of link aggregation in support of his assertion that the Bruckman traces are parallel physical links, as Dr. Houh testified, Bruckman’s reference to link aggregation is not a definition of link aggregation, let alone a comprehensive definition. Ex2026 [Houh Dep. Tr.] at 66:22-70:15. Rather, it is merely a statement as to one potential configuration applicable to link aggregation.

94. In my opinion this single, general statement in Bruckman would not lead a POSITA to conclude that the Bruckman’s traces are arranged as parallel physical links merely because they can be aggregated into a logical link, let alone by overriding the physical layout of the links disclosed in Bruckman, which (a) have different physical endpoints and (b) are drawn as non-parallel physical links. *See, e.g.,* Ex1005 [Bruckman], Fig. 2. Rather, a POSITA would understand that Bruckman’s description of link aggregation (as a “technique by which a group of parallel physical links between two endpoints in a data network can be joined into a single logical link”) allows for configurations in which links that are not arranged in parallel—like Bruckman’s traces—also form part of a single logical link.

95. Third, a POSITA would understand that the arrangement of the traces disclosed in Bruckman simply does not allow for “statistical multiplexing of the frames, in which there is no direct relationship or connection between user ports and backplane traces”—a key innovation of the ’740 patent, as explained *supra*—

because, as Petitioner admits, in Bruckman “each link 30 is associated with only a single trace 52.” Pet., 43.

96. Accordingly, Bruckman fails to disclose or render obvious “coupling each of the one or more interface modules to a communication network using a second group of physical links arranged in parallel,” which dooms the Grounds 1-4, all of which rely upon Bruckman in connection with challenging the independent claims that recite this limitation. Because this limitation (or a similar variation) is present in each independent claim, Petitioner has not shown that any claims are unpatentable.

B. Neither Bruckman Nor Basso Teach Or Suggest “Selecting, In A Single Computation Based On At Least One Of The Frame Attributes, A First Physical Link Out Of The First Group And A Second Physical Link Out Of The Second Group”

97. Limitation 1.6 requires “selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group.” Petitioner asserts that Bruckman alone or in view of Basso render element 1.6 (the “single computation” limitation) obvious. I disagree. As explained in detail below, in my opinion Bruckman and Basso disclose network element architectures in which the first and second links have a predetermined relationship. Such architectures do not allow for two physical link selections from two different groups, as required by this limitation because they only allow for a single physical link to be selected. Further, Bruckman and Basso

fail to disclose (or to render obvious) selections of two such links in a “single computation.”

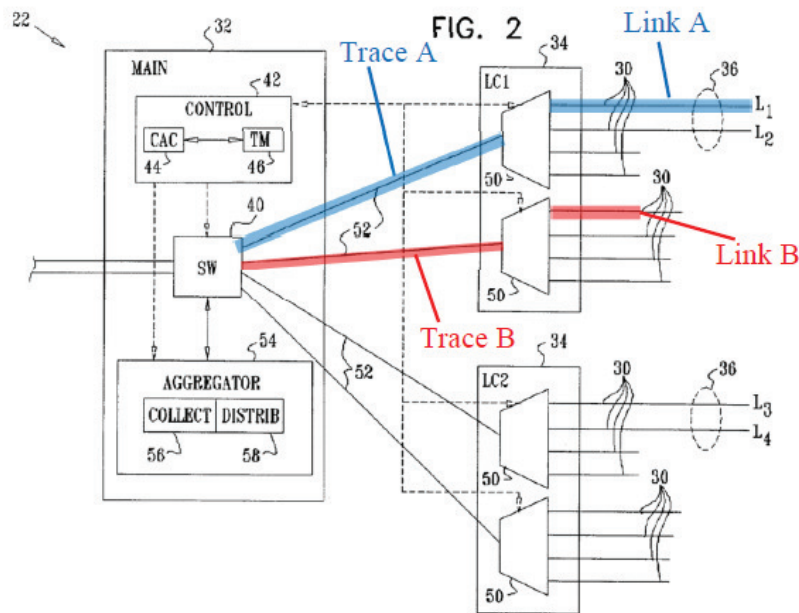
98. Petitioner asserts that Bruckman renders obvious the “single computation” limitation on the basis of (i) Bruckman, which describes a prior art element with a different architecture, in which there is only a single selection (of a link 30 feeding a concentrator 50); or (ii) Basso, which describes a similar prior art element in which there is a similar selection of a port that also governs the selection of the corresponding second physical link and therefore does not disclose two discrete selections.

99. As explained above, “selecting ... a first physical link out of the first group and a second physical link out of the second group” should be construed as “selecting ... a first physical link out of the first group and selecting a second physical link out of the second group, wherein the first physical link is not fixedly assigned to the second physical link.” Neither Bruckman nor Basso disclose first links that are not fixedly assigned to second links; therefore, they do not disclose the two claimed selections, let alone in a single computation.

1. Petitioner’s Ground 1 Fails Because Bruckman Does Not Render Obvious Two Distinct Selections of A First Physical Link And A Second Physical Link.

100. In my opinion, Bruckman fails to disclose two separate selections of a first physical link from a first group and a second physical link from a second group.

101. First, in contrast to the '740 patent (in which the first physical links (e.g., ports) correspond to more than one of the second physical links (e.g., backplane traces)), Bruckman discloses a network element in which the links 30 are fixedly assigned to the traces 52, and every link 30 corresponds directly only to a single trace 52. This is shown in Petitioner's annotated figure below, excerpted from Bruckman:



Ex.1005, Fig. 2 (annotated).

Petitioner states that “each link 30 is associated with only a single trace 52.” Pet, 43-44. Based on this statement, I understand that Petitioner does not dispute that the first link determines the second link. A POSITA would understand this to mean that there are not two separate link selections in Bruckman. As discussed above the concept of two separate link selections is a principal innovation in

network element architecture taught in the '740 Patent and reflected in the independent claims.

102. In particular, Bruckman does not disclose a selection of the second physical links from the second group. Again, Petitioner concedes this very point: “POSITA would have recognized ... that Bruckman’s selection of a link 30 also determines which trace 52 will transmit the data frame.” Pet., 43. A POSITA would understand that determining the Bruckman trace 52 on the basis of the selection of Bruckman’s link 30 is different than selection of the trace (i.e., the second physical link from the second group). Selection of a second link from a “second *group* of second physical links” requires that there be more than one link in each group available to choose from. Ex1001 [’740 Patent], claim 1 (“second group of second physical links”). In Bruckman, given a particular link 30 there is no group of traces to select from. There is only one trace, that which is associated to the selected port.

103. Dr. Houh’s testimony confirms this understanding. Dr. Houh testified that the absence of multiple links (e.g., traces 52) means there is only one path available for the data to travel, such that “you don’t really have a choice” between the second group of links (e.g., Bruckman’s traces 52):

Q. And so you need a mechanism to determine which of the physical links will transmit a particular frame when presented with an option

between several different physical links that connect between two end points, right?

A. I mean, I do talk about such a mechanism in Paragraph 15.

Q. [D]o you need a similar mechanism when there is only one physical link available for a connection between two end points?

A. I don't think it would be necessary in such a case, but you could certainly have a distributor function that -- that distributes frames among one link. But it wouldn't be necessary to do so ...

Q. Why would it not be necessary?

A. Because there's -- you -- the -- the purpose of -- one of the purposes of doing such aggregation is to achieve higher bandwidth by using two parallel paths. So you'd -- you'd want to leverage the fact that you can use two parallel paths to go faster than one path. ***But if there's one path, you don't really have a choice*** if there's one physical link between -- you know, to the other element. You don't really have a choice. Doesn't mean you couldn't distribute among one link, but it's just not -- wouldn't do anything to speed it up or speed up the data transfer.

Ex2026 [Houh Dep. Tr.], 72:15-73:18. In my opinion, Dr. Houh's testimony about one available path—and not really having a choice (i.e., a selection) as to the links

over which to transmit data—accurately reflects Bruckman’s architecture, in which selecting the link 30 leaves only one available option as to the trace over which to send a data frame. A POSITA would thus understand that Bruckman does not disclose selecting a second physical link.

104. Given that Bruckman discloses a system in which the trace is determined—and not selected—by the selection of a link 30, a POSITA would understand that it does not disclose both claimed selections in “a single computation.” As also explained *supra*, the “single computation” limitation is aimed at mitigating the complexity stemming from the need to perform two distinct mapping steps (e.g., of a port and a backplane trace). *See supra*, ¶¶ 72-75. A POSITA would understand that if the first selection also determines the specific trace over which to transmit the data there would be no need for a single computation, as there would be no second mapping step, let alone complexity caused by that second step. As discussed above, the claims require two selections and therefore, a single computation is useful for performing those two selections efficiently. The specification also discloses (i) the non-fixed relationship of the first and second groups of physical links; (ii) the rationale behind providing these groups as non-fixed from one another; (iii) the performance of two mapping operations in sequence (i.e., two selections); and (iv) the manner in which the single computation makes this process more efficient.

105. Unlike the '740 Patent, Bruckman³ discloses a hashing function that does not factor in the available traces, which is further evidence that it does not select a trace as part of the port selection process. *See* Pet., 30 (“Bruckman provides limited description of how the hash computation is used to select a trace.”).

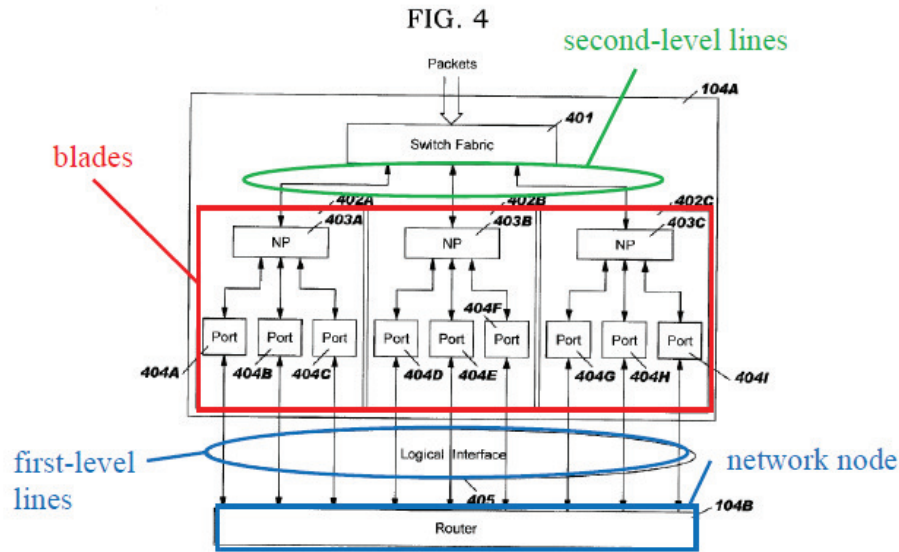
106. Accordingly, a POSITA would understand that Bruckman fails to disclose “selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group.”

2. Petitioner’s Ground 2 Likewise Fails Because Basso Likewise Does Not Render Obvious Two Discrete Selections of A First Physical Link And A Second Physical Link.

107. Petitioner asserts that it would have been “obvious to use the result of a single hash computation to select links from the combination of Bruckman and Basso. Similar to Bruckman, Basso fails to disclose the selection of a second physical link out of a second group. Like Bruckman, in Basso, there is one selection that is part of a single computation that also selects the first link out of the first group.

³ I note Bruckman was assigned to the same assignee as the '740 patent and discloses what appears to be an obsolete, less sophisticated network element.

108. Petitioner asserts that Basso (shown in Petitioner’s annotated figure below) has (i) a set of physical links between an external router 104a and (ii) blades that are connected to the switch fabric and from there to a communication network. Petition at 44.

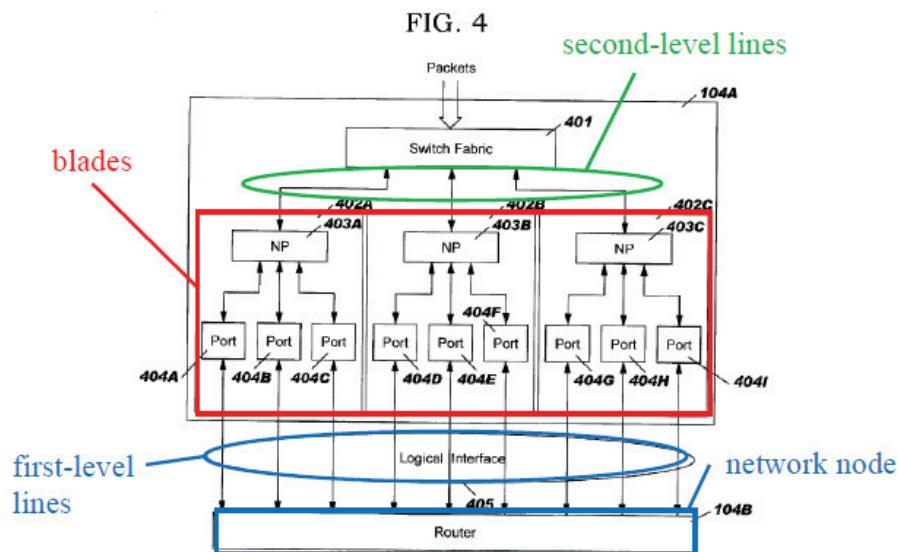


Ex.1006, Fig. 4 (annotated); Ex.1003, ¶82.

109. Petitioner asserts that “[u]pon receipt of a packet, ‘a hash function may be performed on the source destination address in the packet header to generate a hash value’ which Basso then uses to select ‘an appropriate blade/port combination: and, thus, Basso ‘uses a single hash computation to select both a first-level line (one of the ports) and a second-level line (one of the blades)—a blade/port combination.’” In my opinion, Petitioner’s description is misleading because the term “blade/port combination” in Basso does not imply two different selections. Even if it were

accurate, it would still not disclose the required selection of a first and second link in a single computation.

110. First, as is evident from Petitioner’s own annotations (below), the second-level lines—which are presumably what Petitioner identifies as the second physical links—are not Basso’s blades (402A-C):



Ex.1006, Fig. 4 (annotated); Ex.1003, ¶82.

111. The second level lines are the physical links that connect the blades to the switch fabric. In support of its ground, Petitioner has pointed to a “blade/port” combination but has failed to identify any disclosure in Basso concerning the selection of the second-level lines (i.e., the structure that constitutes the alleged second physical links in Basso), let alone in a single computation. But the blades in Basso are not physical links. Instead, the blades are a type of server. Ex1006 [Basso], ¶[0009] (“each blade may comprise one or more network processors.”).

Ex2030, [Sunbird], 1 (“A blade server is a modularly designed server computer that is optimized to use minimal physical space and energy.” Given that the blades in Basso are not physical links, Petitioner’s contention that Basso discloses a selection of a first and second link in a single computation fails.

112. Second, Petitioner’s argument also fails for the same reasons as those discussed in Bruckman. In particular, it is evident to a POSITA from Basso that the “blade/port combination[s]” are arranged—in a strikingly similar fashion as in Bruckman—such that each port in Basso corresponds to only a single blade. *See, e.g.*, Ex1006 [Basso], Fig. 4. For instance, ports 404A-C correspond to blade 402A, ports 404D-F correspond only to blade 402B, and ports 404G-I correspond only to blade 402C. Accordingly, as in Bruckman, in which each trace corresponds only to a single trace, so in Basso, each port corresponds only to a single blade. That is, selection of a port in Basso determines the blade used. There is no selection of blades from a group of blades. As explained *supra* in detail, this is fundamentally inconsistent with the claim language and a principal innovation of the ’740 patent, in particular, the independence between the first physical links and the second physical links.

113. Third, even assuming that the Board credits Petitioner’s argument that the selection of a “blade/port” combination constitutes a selection of two links (it does not), in my opinion, Basso still fails to disclose that the selection is done in a

single computation. In particular, Basso discloses that the hashing function which Petitioner identifies as the single computation that performs the “blade/port” selection occurs only after packets have already been directed to a particular blade:

A network device, e.g., router, may comprise a switch fabric coupled to a plurality of blades where each blade may comprise one or more network processors coupled to one or more ports. These ports may be connected to another one or more network devices. *The switch fabric may be configured to direct incoming packets of data to particular blades where one or more of the network processors in the recipient blade may be configured to process the received packets.*

Ex1006 [Basso], 0009.

Upon a network processor receiving a packet of data, the network processor may index into a table, commonly referred to as a forwarding table, *to determine* the table associated with a particular logical interface as well as *the next destination address*.

Ex1006 [Basso], 0010.

A hash function may then be performed on the received packet to generate a hash value. In one embodiment, a hash function may be performed on the source and destination address in the packet header to generate a hash value.

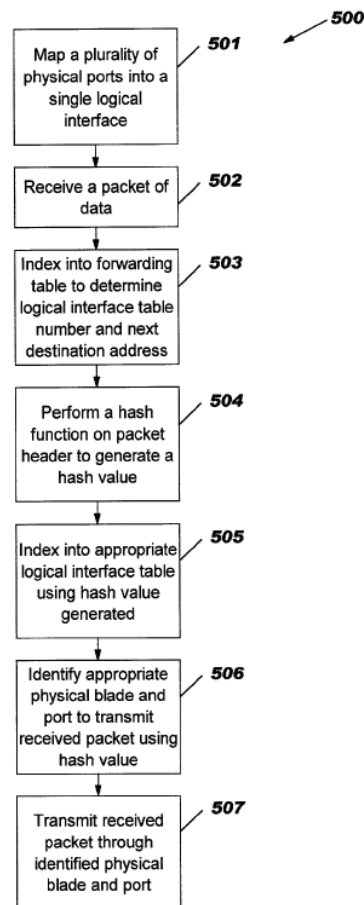
Ex1006 [Basso], 0011.

114. A POSITA would readily understand from these disclosures that the blades are determined by the switch fabric, *i.e.*, before the network processor even performs the hashing operation used to determine an appropriate port. This is—at best—two different computations, one by the switch fabric and one by the blade (in particular, the network processor residing on the blade), and not a single

computation. Thus, Basso's blade and port are not selected in a single computation, notwithstanding the phrase "blade/port combination" used in Basso to describe these components, which more likely refers to the fact that each port is actually part and parcel with a blade that has several ports.

115. Basso describes the same exact order of operations discussed above in a flowchart illustrating how its method works excerpted below:

FIG. 5



Basso discloses the following with respect to the steps shown in Figure 5:

ports are grouped to enable the network processor to transmit packets over them: "in step 501, a plurality of physical ports 404

connected to a particular network device, e.g., router 104B, may be mapped into a logical interface 405. For example, referring to FIG. 4, ports 404A-I of router 104A connected to router 104B may be logically grouped into a logical interface 405 thereby enabling network processor 403, e.g., network processor 403A, to transmit packets of data across multiple physical ports 404 to a particular network device, e.g., router 104B, instead of one physical port 404 as discussed further below.”

Ex1006 [Basso], 0039.

The network processor receives a packet directed to it from the switch fabric: “In step 502, network processor 403, e.g., network processor 403A, may receive a packet of data from switch fabric 401.”

Ex1006 [Basso], 0040. Note the “network processor” is part of a blade. *See, e.g.,*

Ex1006 [Basso], 0009, Fig. 4. Thus, at step 502, the blade has been determined.

The network processor determines the next hop: “Upon receiving the packet of data, network processor 403, in step 503, may index into a table, commonly referred to as a forwarding table, to determine the table associated with a particular logical interface 405 as well as the next destination address, i.e., the next hop address.”

Ex1006 [Basso], 0040.

The hash function is performed after the packet is received by the processor: “In step 504, a hash function may be performed on the

received packet to generate a hash value. In one embodiment, a hash function may be performed on the source and destination address in the packet header to generate a hash value.”

Ex1006 [Basso], 0041.

The “blade/port” combination is identified only after the packet has arrived at the blade: “In step 505, the hash value generated in step 504 may be used to index into the table associated with a particular logical interface 405 determined in step 503. Upon indexing into the table associated with the logical interface 405 determined in step 503, an appropriate blade 402/port 404 combination may be identified in step 506 to transmit the received packet of data as explained below.”

Ex1006 [Basso], 0042.

116. Basso is thus clear that (i) what it refers to as a “blade/port” combination is determined after a packet has already been directed to a particular blade (which includes a network processor); and (ii) the hashing function identified by Petitioner is likewise performed after the switch fabric has already determined the blade to which the packet is directed. Accordingly, in my opinion, a POSITA would understand that the phrase “blade/port combination” in Basso refers to the fact that each blade may have several ports, not that the blade is selected in a separate selection from the port, let alone in a single computation.

117. Accordingly, Petitioner’s contentions based on Basso likewise fail.

C. Neither Bruckman Nor Basso Teach Or Suggest “Selecting ... A Backplane Trace From The Two Or More Backplane Traces.”

118. Independent method claims 14 and 15 contain the limitation “for each data frame, selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces.” Ex. 1001 [’740 Patent], claims 14 and 15. Independent apparatus claims 29 and 30 claim control modules with the same functionality. *Id.*, claims 29 and 30. Claims 16 and 31 (which depend from claims 14 and 29 respectively) also require this functionality.

119. The Board preliminarily found that “Claims 14 and 29 does not require selection between two or more backplane traces that is distinct from selection of a physical link/user port.” DI, 35. The Board referred to this analysis in rejecting Patent Owner’s arguments with respect to claims 15, 16, 30 and 31. DI, 36.

120. Claims 14, 15, 29, 30 and 31 expressly require selecting a backplane trace from “two or more backplane traces,” not user ports. *Id.* For reasons discussed above for claim 1, neither Bruckman nor Basso selects between two or more backplane traces. Instead, they disclose selecting a user port. *See* §VII.B, *Supra*. Each user port maps directly and fixedly to one *single* backplane trace; thus, there is no selection of a backplane trace from a plurality of backplane traces as expressly required by the language of the claims. *See, e.g.*, Ex1001 [’740 Patent], claim 14 (“selecting ... a backplane trace from the two or more backplane traces”); Ex2027

[Merriam-Webster], 13 (“Select: chosen from a number or group by fitness or preference.”).

121. Further, the claims require that both the backplane traces and user ports must be coupled to a “user interface module.” Ex1001 [’740 Patent]. And the selection of backplane traces must be based on “the respective frame attributes” of the “data frame”—that is, the system looks at frame attributes such as “header fields” (Ex. 1001 [’740 Patent], 1:62-64) and, based on that information, chooses which backplane trace to use. None of the asserted references teach or suggest this element because the asserted references at best disclose selecting user ports, not backplane traces.

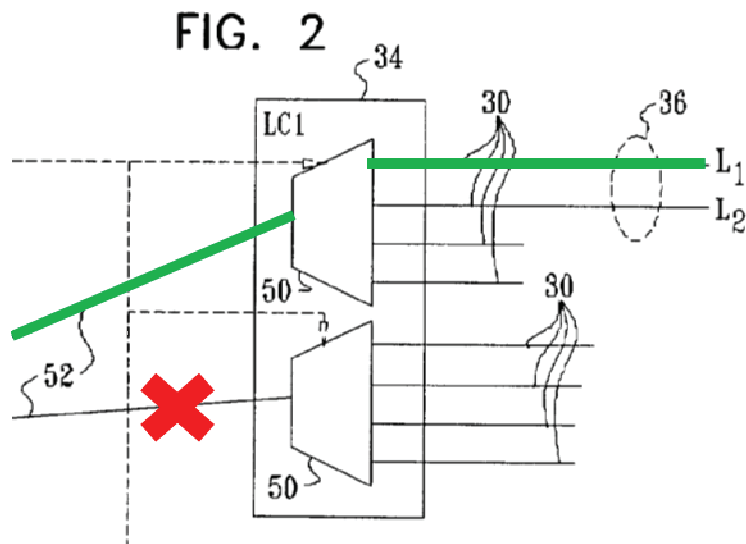
122. The Petition relies on Bruckman and/or Basso for this limitation, ultimately relying on the Petition’s analysis of limitation 1.6 (i.e., “selecting, in a single computation based on at least one of the frame attributes, a first physical link out of the first group and a second physical link out of the second group”). Pet., 41-45 (claim 1), 68-69 (claims 14 and 15), 74-75 (claims 29 and 30). Thus, the Petition’s analysis for this limitation is identical to the analysis discussed above for claim 1. As such, this limitation fails for the same reason limitation 1.6 does.

123. The Petition admits that “Bruckman provides limited description of how the hash computation is used to select a trace.” Pet., 42-43. That is because Bruckman’s hash computation does not “select[] a backplane trace” as expressly

required by the claims. As discussed above for claim 1, Bruckman's hash computation at best discloses selecting link 30 to external "customer nodes." This "determines which [backplane] trace 52 will transmit the data frame." *See supra*, §VII.B.1; Pet., 43. That is, Bruckman selects the physical link 30 between a port and customer node, with each port corresponding to a single trace 52. Because Bruckman must use the trace 52 that corresponds to physical link 30 (*Id.*), there is no selection of a trace.

124. Put another way, claims 14-16 and 29-31 require selecting a backplane trace from "two or more backplane traces" that are not determined by which first link (or port) has already been selected. Ex. 1001 ['740 Patent], claims 14-16, 29-31. As illustrated by the excerpt below from Bruckman Fig. 2, each link 30 is connected to a "concentrator" / "multiplexer" 50 that multiplexes traffic from links 30 onto trace 52. Ex. 1005 [Bruckman], ¶[0056]. However, once a port is selected, the trace 52 connected to that port must be used. Thus, Bruckman cannot select from "two or more backplane traces" as required by the claims because there is only one backplane trace.

125. In the example below, once the link 30 that is highlighted in green is selected, Bruckman must use the corresponding trace 52 that is also highlighted in green. Bruckman cannot select the trace 52 marked with the large red X because that trace is connected to a different concentrator/multiplexer 50.



126. This is different from claim 14 and the '740 patent, where multiple ports and multiple traces are each connected to the interface module. *See, e.g., Ex. 1001 [’740 Patent]*, claim 14 (“coupling the user ports to one or more user interface modules ... coupling each user interface module ... via a backplane using two or more backplane traces arranged in parallel”). Thus, Bruckman does not allow for “selecting ... a backplane trace from the two or more backplane traces” as required by the claim because only a single backplane trace can be used. Accordingly, Bruckman does not teach this limitation.

127. The Petition argues that Basso selects a “blade/port combination” to incorrectly imply that Basso selects both a blade and a port. *Pet.*, 45. But as discussed above, in Basso, the port is part of the blade and any selection is of only a port, not a blade (*see supra*, §I.A), since each port corresponds directly to only one blade (and therefore it is the port that is selected, not the blade). *Id.* Thus, for reasons

similar to Bruckman, in my opinion, in Basso there is no selection of a “backplane trace from [] two or more backplane traces” as required by the claims—once the port is selected, there is only a single backplane trace (i.e., not “two or more backplane traces” as required by the claims) that can be used.

128. Moreover, the backplane trace must be selected “responsively to at least one of the respective frame attributes.” *Id.* The Petition does not explain how Bruckman or Basso considers frame attributes in selecting a backplane trace. Pet., 41-45. Accordingly, neither Bruckman nor Basso teach or suggest this limitation.

D. Petitioner Fails To Show That Bruckman Renders Limitation 29.3 Obvious

129. The Petition identifies the limitation “a backplane having the one or more user interface modules coupled thereto and comprising a plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network” as limitation 29.3. Pet., 74. *See* Ex1001 [’740 Patent], 16:1-5. The Petition states only “[c]onsistent with the discussion above at [3.1] and [18.1], Bruckman renders this limitation obvious.” Pet., 74. For limitation [18.1] (“The apparatus according to claim 17, and comprising a backplane to which the one or more interface modules are coupled, wherein the second physical links comprise backplane traces formed on the backplane”), the Petition states only “[c]onsistent with the discussion above at [3.1], Bruckman renders this limitation obvious.” Pet., 73.

130. Limitation [3.1] is “[t]he method according to claim 1, wherein the second physical links comprise backplane traces formed on a backplane to which the one or more interface modules are coupled.” Ex1001 [’740 Patent], 11:25-27. The Petition’s discussion of this limitation does not explain how Bruckman discloses a “plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network” as required by limitation 29.3.

131. The Petition cites Dr. Houh’s declaration at paragraph 221, but that paragraph simply states “[c]onsistent with the discussion above at [3.1] and [18.1], Bruckman renders obvious [this limitation].” Thus, Dr. Houh’s Declaration also provides no analysis or evidence explaining why Bruckman renders this limitation obvious.

E. The Petition Fails To Address Several Limitations Of Claims 29 and 30

132. The Petition labeled the following limitations of the ’740 Patent as [29.1], [29.2] and [30.2], respectively:

- “[29.1] one or more user interface modules coupled to the user ports, which are arranged to process data frames having frame attributes sent between the user ports and the communication network,” (Pet., 103).

- “[29.2] at least one of said user interface modules being bi-directional and operative to communicate in both an upstream direction and a downstream direction;” (Pet., 103).
- “[30.2] which are arranged to process data frames having frame attributes sent between the user ports and the communication network;” (Pet., 104).

133. The Petition fails to address these limitations. The Petition omits any discussion of limitations 29.1 and 29.2:

28. Claim 29

[29.0] *Apparatus for ... modules being bi-directional...*

See [17.0]-[17.2]. Ex.1003, ¶¶218-20.

[29.3] *a backplane having the one or more user interface modules coupled thereto and comprising a plurality of backplane traces arranged in parallel so as to transfer the data frames between the one or more user interface modules and the communication network,*

Consistent with the discussion above at [3.1] and [18.1], Bruckman renders this limitation obvious. Ex.1003, ¶221.

Pet., 74.

The Petition rennumbers limitation 30.2 as a different limitation but omits any discussion of the limitation requiring “which are arranged to process data frames

having frame attributes sent between the user ports and the communication network”:

[30.1] *one or more ...;*

Consistent with the discussion above at [17.1], Bruckman renders this limitation obvious. Ex.1003, ¶225.

[30.2] *a backplane having the one or more user interface modules...;*

See [29.3]. Ex.1003, ¶226.

Pet., 75.

VIII. CONCLUSION

134. I hereby declare that all statements made herein of my own knowledge are true and all statements made herein on information and belief were and are believed by me to be true, and that all statements herein were and are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code and that any such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Respectfully submitted,



Miguel Gomez

Dated: December 15, 2023