

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
U.S. Patent No. 7,545,740

PATENT OWNER'S RESPONSE PURSUANT TO 37 C.F.R. § 42.120

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2006	United States District Courts National Judicial Caseload Profile For the 12 Months Ending March 31, 2023 (available at https://www.uscourts.gov/sites/default/files/data_tables/fcms_na_distprofile0331.2023.pdf) (“March 23 Judicial Caseload Statistics”)
2007	<i>Orckit Corporation v. Cisco Systems, Inc.</i> , Case No. 2:22-cv-00276, Dkt. No. 50 (E.D. Tex., Feb. 3, 2023), Notice of Compliance (“2-3-2023 Notice of Compliance”)
2008	U.S. Pat. No. 6,963,578 (“Akahane”)
2009	December 11, 2008 Final Rejection (U.S. Appl. No. 11/123,801) (“’801 Application Final Rejection”)
2010	July 28, 2008 Claim Amendments (U.S. Appl. No. 11/123,801) (“’801 Application Pending Claims”)
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2028	<i>Excerpts from All About Circuits online electronics textbook. Available at https://www.allaboutcircuits.com/textbook/direct-current/chpt-5/simple-parallel-circuits/. Last accessed December 11, 2023. (“All About Circuits”).</i>
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2030	<i>Excerpts from https://www.sunbirdcim.com/glossary/blade-server. Last accessed December 11, 2023. (“Sunbird”).</i>
2031	<i>Excerpts from “IEEE 100 The Authoritative Dictionary of IEEE Standards Terms,” 7th Ed., 2000.</i>
2032	<i>Excerpts from “Basic Electricity”, available at https://pressbooks.bccampus.ca/basicelectricity/chapter/ground/, last accessed 12/11/23.</i>

I. INTRODUCTION

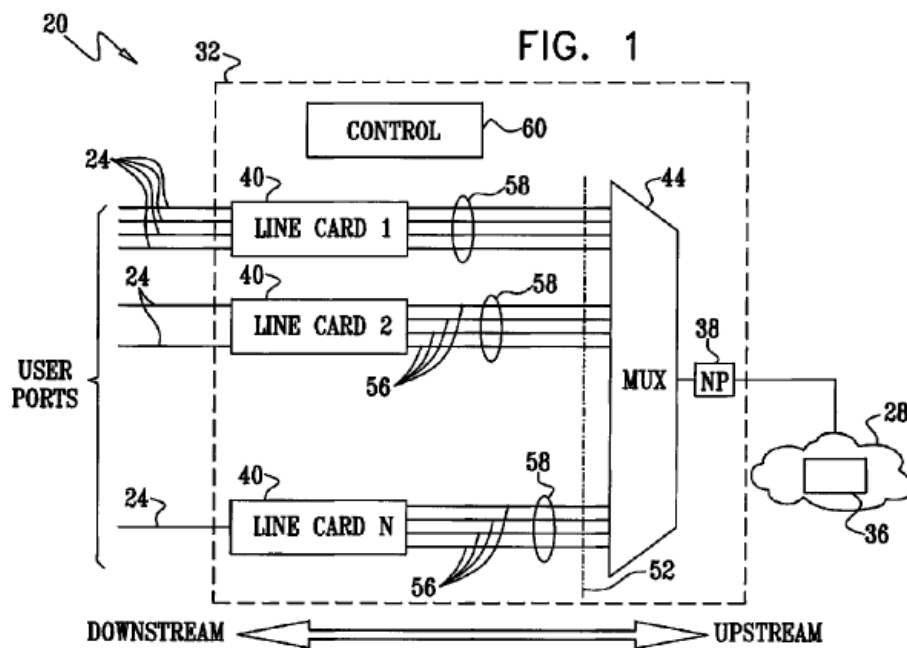
Orckit Corporation (“Orckit” or “Patent Owner”) submits this Patent Owner Response to Cisco Systems, Inc.’s (“Petitioner”) Petition challenging Claims 1-31 of U.S. Patent No. 7,545,740 (“’740 Patent”).

The ’740 Patent discloses novel techniques for performing link aggregation in communication networks. Link aggregation is a technique for combining groups of physical links into logical links, which can be used to improve network performance, including by increasing the bandwidth or better prioritizing traffic between network endpoints. Link aggregation applies to links between different network nodes (e.g., the port connections between a network switch and a network end-user) as well as links between the internal components of network elements (e.g., the traces within a network switch that connect its “line card” to its backplane or multiplexer). Data (e.g., frames) transmitted over a network follow paths made up of both types of links; and the manner in which the links are selected to map the paths followed by network traffic is critical in network communications.

The ’740 Patent is directed to a novel and non-obvious network element architecture in which two groups of physical links of a network element such as a switch (e.g., the ports and backplane traces) are both selectable (i.e., the selection of one link does not in and of itself determine the selection of the other link). As the ’740 Patent teaches, this feature provides greater flexibility in the various techniques

relevant to the mapping of data paths, including statistical multiplexing and load balancing.

The '740 Patent and its claims accomplish this by arranging the physical links internal to a network element (e.g., backplane traces 56) in parallel and coupling them to a user interface module (e.g., line card 1) that is also coupled to the external physical links of the network element (e.g., ports 24), for example, as shown in Figure 1 of the '740 Patent:



Because the backplane traces in each group (e.g., the group connected to line card 1) are arranged in parallel, they are coupled to the same relevant endpoints: (i) in the *downstream*, to an interface module (e.g., line card 1) that links each trace (56) in the group to the same ports (24), and (ii) in the *upstream*, to the same network 28

(e.g., via another element such as a multiplexer 44 or a network processor 38, depending on the exact implementation).

In this manner, a frame traveling from one of the ports 24 through line card 1—on its way upstream to network 28—may follow a path along *any* one of several backplane traces 56. Likewise, a frame on a downstream path from network 28 to one of the ports 24 (e.g., corresponding to line card 2) may follow a path along *any* one of several backplane traces 56 associated with that line card.

The independent claims reflect this flexible mapping. Claims 1, 4, 5, 13, 17, 19, 20, and 28 require selecting a first physical link (e.g., a port) out of a first group and a second physical link (e.g., a backplane trace) out of a second group. And claims 14, 15, 29, 30 require selecting a backplane trace from a group of traces linked to the same interface module and thus to the same ports.

Though this flexible mapping improves (among other things) the ability to balance loads and prioritize traffic across multiple traces, it also increases the complexity mapping as compared to the prior art, in which “each user port [was] *fixedly assigned* to a specific backplane trace.” Ex1001 [’740 Patent], 1:66-2:4. To reduce the hardware and computational complexity of performing two link selections, the ’740 Patent discloses performing those selections (or a combined mapping operation) in a single computation. Ex1001 [’740 Patent], 7:17-34. This

single computation selection is likewise reflected in many of the independent claims 1, 4, 5, 13, 17, 19, 20, and 28.

Thus, the improved methods and apparatuses covered by the '740 Patent combine three key elements that work together in *tandem*: (a) parallel arrangement of internal physical links (to permit link independence); (b) internal link (e.g., backplane trace) selection that is not governed by the external port over which data may be sent (to permit flexible mapping); and (c) single computation selection (to reduce computational and hardware complexity stemming from the flexible mapping that comprises two link selections).

Against this backdrop, Petitioner asserts that “the concept of bi-directional, aggregated links was already known and would have been obvious to a POSITA.” (Petition at 8). Petitioner’s assertion misses the point. The '740 Patent and its original assignee Orckit-Corrigent never purported to invent link aggregation. Rather, the '740 Patent presents an improvement in the devices and methods that were used to—among other things—perform link aggregation. Orckit-Corrigent innovated and obtained patents in the networking space (and in link aggregation) well before the '740 Patent issued. Even Petitioner’s primary reference—Bruckman—was originally assigned to Orckit-Corrigent, which explains why Bruckman and the '740 Patent use some similar terminology.

That Bruckman was assigned to Orckit-Corrigent before the later-issued '740 Patent also explains why Bruckman—as an obsolete precursor to the '740 Patent—lacks (among other things) any of the three key elements in the '740 Patent discussed above: parallel trace arrangement, two discrete link selections, and single computation selection.

Petitioner's other reference, Basso, fares no better. Petitioner points to Basso's shorthand use of the term "blade/port combination" to assert that Basso discloses selection of both a first and second link (e.g., a port and a backplane trace) in a single computation. As explained below in detail, however, this is wrong, if not outright misleading, as Basso's ports are part of its blades (thus, they are not discretely selectable links), and in any event, Basso's system selects the port through which to transmit a frame well *after* that packet has already arrived on a blade (thus, any selection cannot be performed in a single computation).

Accordingly, and as explained in detail below, the Board should reject Petitioner's grounds and uphold the claims in the '740 Patent.

II. BACKGROUND

A. Procedural History

This proceeding is one of four IPRs filed by Petitioner against Patent Owner. The other IPRs are IPR2023-00402 (U.S. Pat. No. 8,830,821), IPR2023-00554 (U.S. Pat. No. 10,652,111) and IPR2023-00714 (U.S. Pat. No. 6,680,904). Each of the

'740, '821, '111 and '904 Patents was asserted by Patent Owner against Petitioner in *Orckit Corporation v. Cisco Systems, Inc.*, Case No. 2:22-cv-00276 (E.D. Tex. July 22, 2022). Patent Owner and Petitioner have agreed to a jointly stipulated dismissal of the district court litigation without prejudice. Ex2029 [Stipulation of Dismissal].

B. Patent Owner

Orckit Corporation owns the '740 patent, which originated from significant research and development by Orckit Communications Ltd. (also known as Corrigent-Systems Ltd., referred to herein as "Orckit-Corrigent").

Orckit-Corrigent was founded in 1990 by Izhak Tamir and Eric Paneth. Orckit-Corrigent's products offered networking infrastructure for the delivery of residential, business, and mobile backhauling services in packet-based networks.

By the early 2000s, Orckit-Corrigent was a pioneer in telecommunications, with revenues some years exceeding \$500M from sales to various tier 1 global telecommunications providers. Over the years, Orckit-Corrigent and its subsidiaries developed and sold products in a variety of telecommunications areas, including DSL, Packet Transport Networks (PTN), Carrier Ethernet technologies, PWE (Pseudo-Wire Emulation) technology, and Resilient Packet Ring (RPR) technology, which was developed and introduced to the market as the IEEE 802.17 Standard, part of the company's packet transport technology. In 2007, Orckit-Corrigent

launched its CM4000 PTN line of products, which were purchased and deployed by telecom providers worldwide, including leading Indian carrier Bharat Sanchar Nigam Ltd. (BSNL); T-Systems (Deutsche Telekom) in Germany; Tele2, a leading Pan-European Scandinavian Service Provider; redIT (formerly MetroNet) in Mexico, and others. At one time, Orckit-Corrigent had offices in Israel, US, India, Japan, Korea, Germany, Russia, Brazil, Mexico, Thailand, and the Philippines.

Orckit-Corrigent also engaged in extensive research and development (investing over \$200M) and prosecuted an extensive patent portfolio. Many of the patents in this portfolio were practiced by its products, notably, the CM-4000 product family, which was a series of packet transport network switches (consisting of, among other products, the CM-4140, CM-4206 and CM-4314T/4314 models), and the CM-401x portfolio of switches that included the CM-4011, CM-4012 and CM-4013 products. Ex2013, [Orckit-Corrigent Executive Summary]. Indeed, the breadth and importance of Orckit-Corrigent's research and development is evident from the fact that the primary reference in the Petition ("Bruckman" [Ex1005]) was issued to Orckit-Corrigent and covered an early version of Orckit-Corrigent's network device product portfolio, a predecessor to the architecture covered by the later-issued '740 patent.

In 2012, Orckit-Corrigent entered into debt restructuring/bankruptcy proceedings in Israel. After a series of transactions that followed the Israel

proceedings, Orckit Corporation acquired a smaller set of Orckit-Corrigent's patents, including the '740 patent.

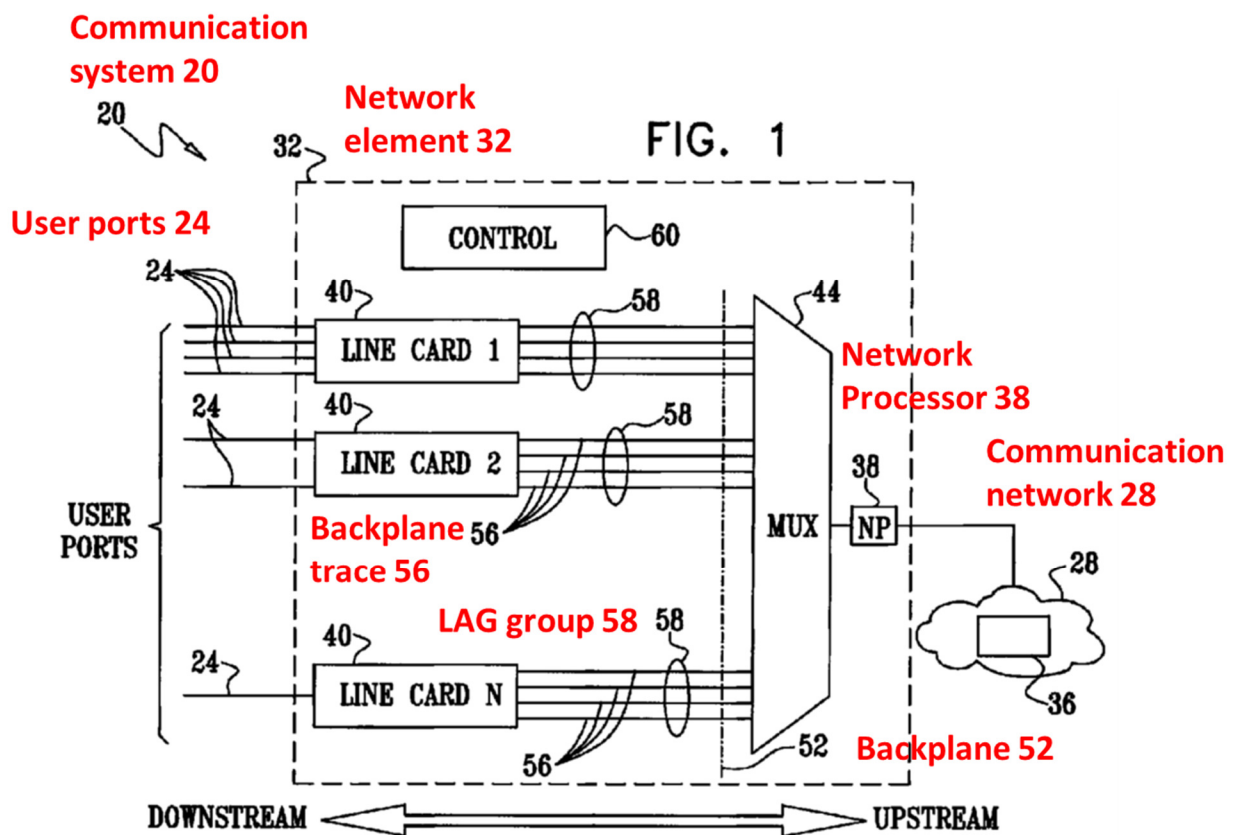
C. '740 Patent

The '740 Patent is directed to innovative methods and apparatuses that can perform two-way “link aggregation” in communication networks. Ex1001 ['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.” Ex1001 ['740 Patent], 1:11-13. Users may connect to a communication through “network element[s], such as ... access concentrator[s] or aggregator[s].” Ex1001 ['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.” Ex1001 ['740 Patent] 7:9-16.

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).

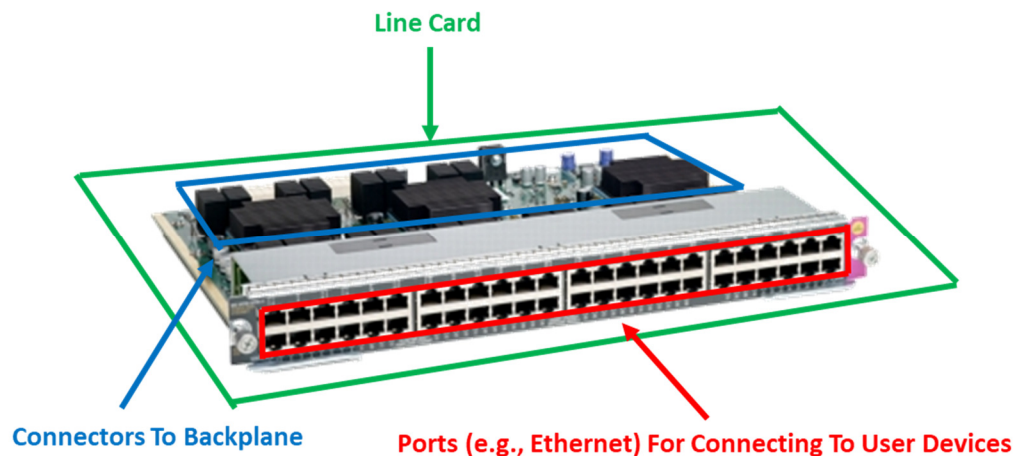
Figure 1 (annotated below) schematically illustrates a communication system in accordance with one embodiment of the '740 Patent. Ex1001 ['740 Patent], 4:5-7:



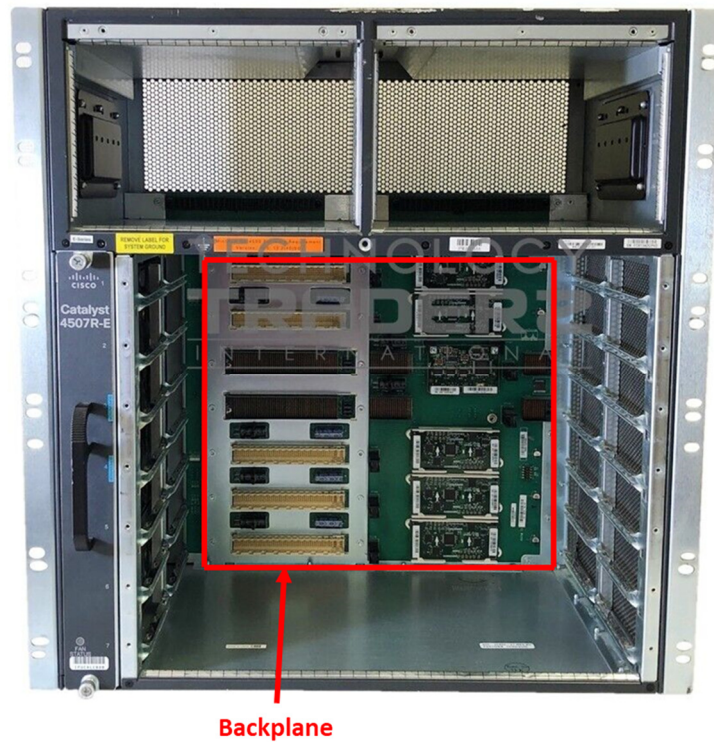
User ports 24 (e.g., the ports that connect to PCs or other user devices) are shown on the left. Each user port is connected to a line card 40. Ex1001 [’740 Patent], 4:29-30. Each line card 40 processes data frames from one or more user ports. *Id.* The line cards (also referred to as User Interface Modules or “UIMs”) are

coupled to a backplane 52 through groups of backplane traces 56. *See, e.g.*, Ex1001 [’740 Patent], 4:34-36. (“Backplane 52 comprises physical links, such as backplane traces 56, typically in the form of printed circuit board (PCB) conductors.”). These traces are connected to the line cards 40, such that each of the ports 24 may be coupled—through the line cards 40—to more than one backplane traces. Ex1001 [’740 Patent], 4:28-33. Thus, the line cards 40 serve to connect (i) any one of the ports out of the group of user ports 24 connected to each of the line cards to (ii) any one of the backplane traces out of the group of backplane traces 56 connected to the same line card.

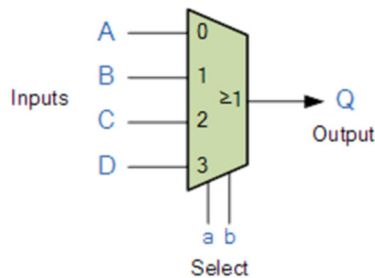
For reference, a real-world example of a line card is shown below with some of the elements discussed in the ’740 Patent highlighted:



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:



In the '740 Patent, the backplane 52 may also be connected to a multiplexer (MUX) 44. Ex1001 ['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:



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

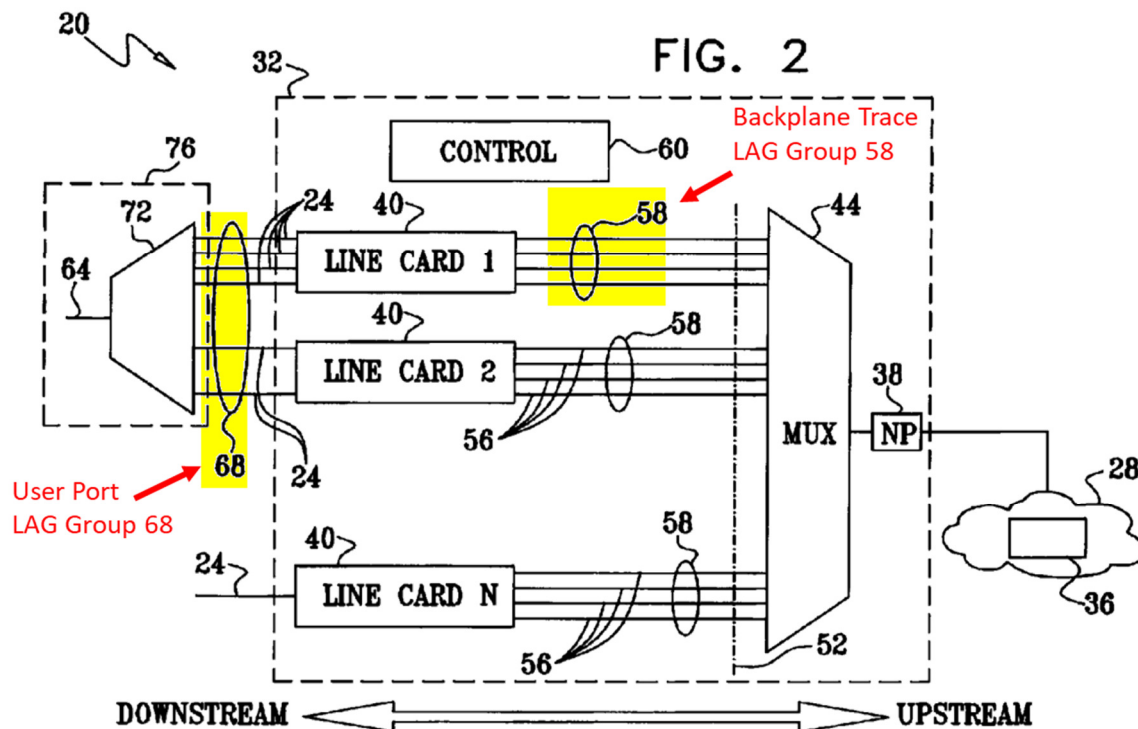
a single upstream output that is sent to network processor 38 and then further upstream to node 36 of communication network 28. Ex1001 ['740 Patent], 4:39-42. “In the downstream direction, network processor 38 of network element 32 accepts a downstream input comprising downstream frames addressed to 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.” Ex1001 ['740 Patent], 4:43-47.

The '740 Patent teaches further that the frames may be distributed among different ports in a first group of ports and/or different backplane traces in a second group of backplane traces to balance the load, thereby increasing bandwidth and quality of service across the network. *See, e.g.*, Ex1001 ['740 Patent], 2:8-11 (“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].”); Ex1001 ['740 Patent], 5:25-27 (“The mapping function distributes the frames among the different backplane traces so as to balance the load between the traces.”).

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. Ex1001 ['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. Ex1001 ['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.”).

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



The '740 Patent discusses that “[i]n general, the processing of [] frames in network element 32 comprises two consecutive mapping operations.” Ex1001 ['740 Patent], 6:54-55. “First, each frame is mapped to one of user ports 24 in external

LAG group 68.” Ex1001 [’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.” Ex1001 [’740 Patent], 6:57-58. “Then, the same frame is mapped to one of backplane traces 56 in the appropriate LAG group 58.” Ex1001 [’740 Patent], 6:58-60.

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. Ex1001 [’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.

1. Prosecution History

U.S. Pat. Appl. No. 11/279,045 was filed on April 7, 2006. Ex1002 [’740 File History], 205. On October 2, 2008, the Examiner issued a non-final rejection rejecting as-filed claims 1-3, 6-12, 14, 16-18, 21-27, 29 and 31 as anticipated by

Akahane (U.S. Pat. No. 6,963,578) and objecting to the remaining claims as being dependent on a rejected base claim. *Id.*, 82-85.

On December 31, 2008, the Applicant filed a response amending independent claims 1, 14, 17 and 29 to clarify that the claimed physical links and interface modules operated in a bi-directional (i.e., upstream and downstream) manner and rewriting the objected-to dependent claims 4-5, 13, 15, 19-20, 28 and 30 as independent. *Id.*, 76-77. Based on these amendments, the applicant distinguished Akahane's teachings of "separate and dedicated input lines and output lines" that are not bi-directional. *Id.*, 77.

On January 19, 2009, the applicant filed a Supplemental Informational Disclosure Statement disclosing several references including Bruckman, Petitioner's primary reference. Ex1002 ['740 Patent File History], 55. In addition, the applicant disclosed for the examiner's consideration a Final Rejection dated December 11, 2008, which issued during the prosecution of applicant's U.S. Patent Application Number 11/123,801. *Id.*, 54. This Office Action discussed Bruckman in detail as the basis for a final rejection on similar claims. Ex2009 ['801 Application Final Rejection].

On January 27, 2009, the Examiner initialed the IDS, indicating they had considered Bruckman, along with the other references disclosed in the IDS. *Id.*, 44.

On February 2, 2009, the Examiner issued a notice of allowance. *Id.*, 38-40. The '045 Application issued as the '740 Patent on June 9, 2009. *Id.*, 32.

2. Challenged Claims

Petitioner challenges all claims 1-31 of the '740 Patent. A first set of the independent claims (claims 1, 4, 5, 13, 17, 19-20, 28) of the '740 Patent require “select[ing], 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” to transmit each frame over. *See, e.g.*, Ex1001 ['740 Patent], claim 1.

A second set of the independent claims (claims 14, 15, 29, 30) require “selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces.” Unlike the first set, these claims do not require selecting, in a single computation, a first link out of a first group and a second link out of a second group. As with the first set, however, the independent claims in the second set require that the claimed “backplane traces” be “arranged in parallel,” that they are used for coupling a “user interface to the communication network,” and that one of the backplane traces is selected “to send the data frame.”

The dependent claims—which depend from claims in both groups—recite additional functionalities such as multiplexing, load balancing, and the use of hashing and other mapping functions. *See, e.g., id.*, claims 6-11, 21-26.

D. Petitioner's Cited References

The Petition asserts four grounds.:

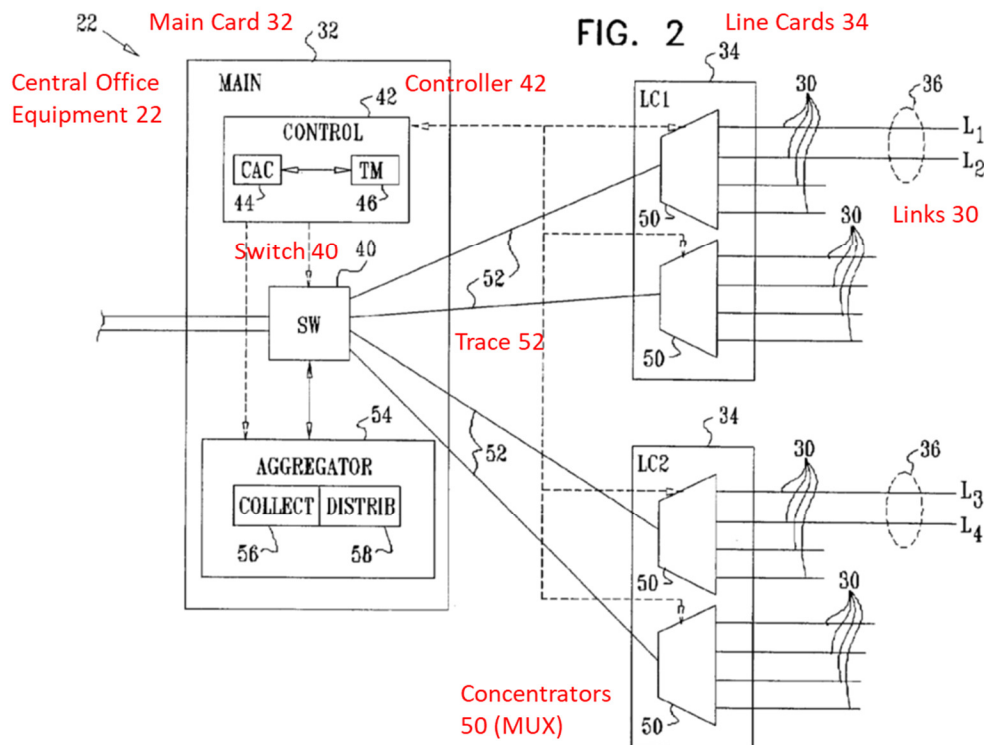
1. Claims 1-31 are obvious over Bruckman
2. Claims 1-31 are obvious over Bruckman and Basso
3. Claims 11 and 26 are obvious over Bruckman and Holdsworth
4. Claims 11 and 26 are obvious over Bruckman, Basso and Holdsworth

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

1. Bruckman (Ex1005)

Bruckman (Pat. Publ. No. US2004/0228278) is directed to “Bandwidth Allocation for Link Aggregation.” Ex1005 [Bruckman], Title. Notably, Bruckman was assigned to Orckit-Corrigent, the same assignee as the later-issued '740 patent, which is directed to improved apparatuses and methods for link aggregation.

Bruckman Fig. 2 (annotated below) is a block diagram that shows details of communication equipment capable of link aggregation in accordance with one embodiment of Bruckman. Ex1005 [Bruckman], ¶[0045].

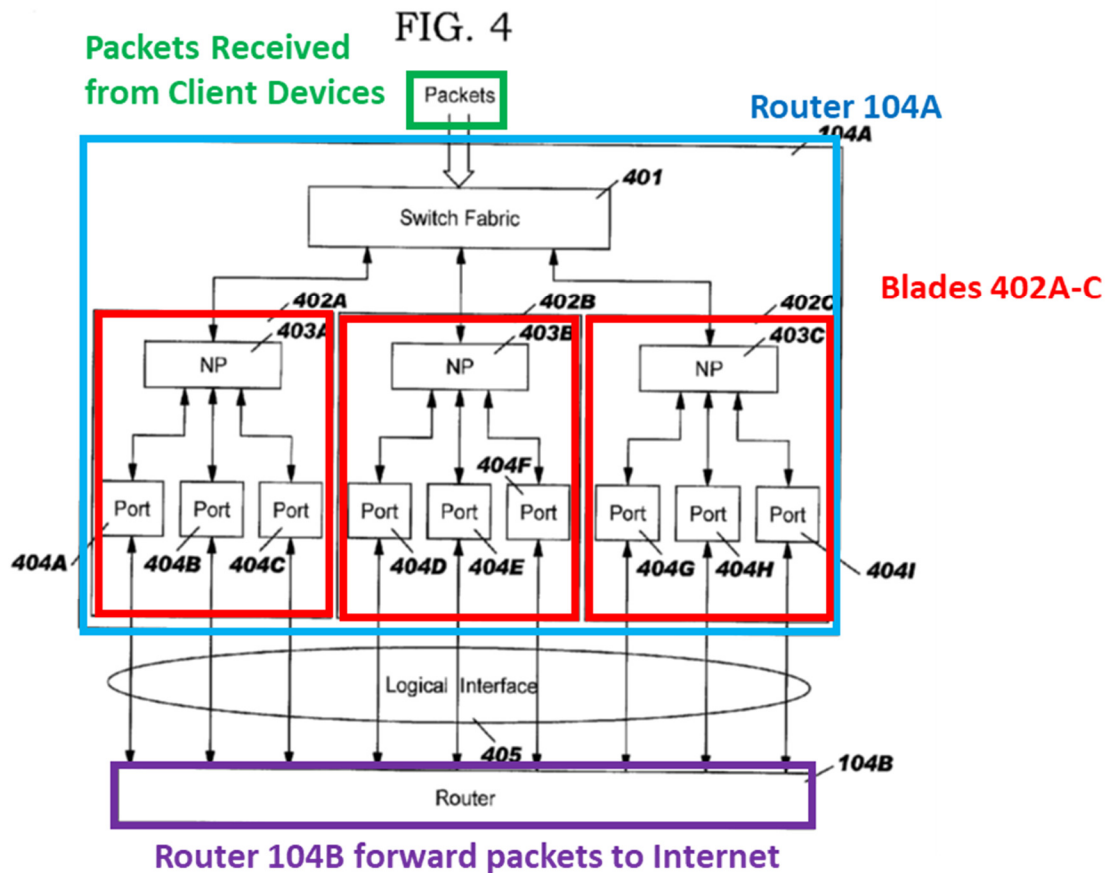


In Bruckman, switch 40 “switches traffic to and from line cards 34” via traces 52. Ex1005 [Bruckman], ¶[0049]. “The operation of switch 40 is managed by a controller 42.” Id. “Each line card 34 comprises one or more concentrators 50, which comprise multiple ports that serve respective links 30.” Id., ¶[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 transmit the packet to a customer node.. Id., ¶[0047]. “[D]istributor 58 determines the link over which to send each frame based on information in the frame header”, preferably by using a predetermined hash function. Id., ¶[0058]. Since each link 30 has only

one corresponding trace, selection of a link 30 also determines the trace 52 to be used. Pet., 42-43 (“Bruckman’s selection of a link 30 also determines which trace 52 will transmit the data frame.”).

2. Basso (Ex1006)

Basso (Pat. Pub. US2003/0210688) is directed to “logically grouping physical ports into logical interfaces to expand bandwidth.” Ex1006 [Basso], Title. Basso Fig. 4 (annotated below) illustrates an embodiment of a router with logical groupings of its physical ports. Ex1006 [Basso], ¶[0018]:



In Basso Fig. 4, packets are received from client devices at switch fabric 401. Ex1006 [Basso], ¶[0030]. The switch fabric 401 directs frames to one of the blades 402A-C, each of which includes a network processor 403A-C. Ex1006 [Basso], ¶[0030]. “[N]etwork processor 403 may be configured to receive a packet of data from switch fabric 401.” Ex1006 [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.*

Basso discloses that “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].” Ex1006 [Basso], ¶[0032]. Basso purports to address this problem by transmitting packets of data “across multiple physical ports to a particular network device from a particular network processor” to increase the bandwidth available for that transmission. Ex1006 [Basso], ¶[0033]. Thus, Basso discloses that a particular network processor (403A-C) residing on one of the blades (402A-C) chooses one of the physical ports attached to that same blade to transmit packets of data.

Basso teaches that hash values may be used to identify “an appropriate blade/port combination.” Ex1006 [Basso], ¶[0012]. These blade/port combinations are stored as entries in a table with each port having a corresponding blade assigned to it. Ex1006 [Basso], ¶[0043]. Notwithstanding that Basso refers to “blade/port

combinations,” it discloses ports (as well as network processors) that are part of specific blades and therefore fixedly assigned to those specific blades. Thus, (similar to the links in Bruckman that correspond only to a single trace) each port corresponds only to a single blade.

3. Holdsworth (Ex1007)

Holdsworth appears to be excerpted portions of the book “Digital Logic Design” by Brian Holdsworth and Clive Woods. Ex1007 [Holdsworth]. The excerpted portions comprise several single, non-sequential pages that purport to discuss multiplexers and decoders. Id., 3-7. To the extent that it is relevant to the discussion of Petitioner’s grounds, Holdsworth is addressed below.

E. Level of Ordinary Skill

The Institution Decision adopted Petitioner’s level of ordinary skill. DI, 21. For purposes of this Patent Owner Response, Patent Owner does not dispute Petitioner’s level of ordinary skill.

III. CLAIM CONSTRUCTION

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

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.” Ex1001 [’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.

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, 30.² Though Patent Owner agrees there is

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.

² The Decision on Institution states “[c]laim 1 does not require a first selection of a first link followed in time by a second selection of a second link, as argued by Patent Owner.” DI, 30. Respectfully, Patent Owner did not intend its Preliminary Response arguments to be interpreted to require a temporal requirement. Indeed,

no temporal requirement, Patent Owner respectfully submits that the claims nonetheless require two distinct selections.

As discussed below, the claim language requires *two* selections from two different groups of links, and, consistent with the claim language, the specification disavows any configurations where *the user port is fixedly assigned to a specific backplane trace*. 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.”

1. The Claims Require Patent Owner’s Construction

“[T]he claims of a patent define the invention to which the patentee is entitled the right to exclude.” *Phillips v. AWH Corp.*, 415 F.3d 1303, 1312 (Fed. Cir. 2005) (internal quotation and citation omitted). The plain language of this limitation requires two selections (i.e., “selecting ... a first physical link out of the first group *and* a second physical link out of the second group”). Ex2024 [Gomez Decl.], ¶63.

since both selections are performed by a “single computation,” the claims clearly allow for both selections to be performed at the same time.

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.” Ex1001 [’740 Patent], claim 1. Thus, two selections are required.

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. Ex1001 [’740 Patent], claim 1. This means both selections must select from a group consisting of a plurality of links. *See, e.g.*, Ex2027 [Merriam-Webster] (“Select: chosen from a number or group by fitness or preference”; “Group: an assemblage of objects regarded as a unit”). If there is only one predetermined second physical link that must be used, there is neither a “selection” of “a second physical link” nor a “second group” as expressly required by the claims. And the claims require the “second group” to comprise of “second physical links,” thus the group must include a plurality of second physical links to choose from. Ex1001 [’740 Patent], claim 1.

2. The Specification Confirms Patent Owner’s Construction

“[T]he specification is always highly relevant to the claim construction analysis. Usually, it is dispositive; it is the single best guide to the meaning of a disputed term.” *Phillips*, 415 F.3d at 1315. Consistent with the claims, the specification is directed entirely to embodiments in which two discrete selections of physical links are performed in a “single computation.”

“[T]he patentee may demonstrate intent to deviate from the ordinary and accustomed meaning of a claim term by including in the specification expressions of manifest exclusion or restriction, representing a clear disavowal of claim scope.” *See Thorner v. Sony Computer Entertainment America LLC*, 669 F.3d 1362, 1366 (Fed. Cir. 2012). Consistent with the plain and ordinary meaning of the independent claims, 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.

Ex1001 [’740 Patent], 1:66-2:4 (emphasis added).

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. 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.

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 selects a port (and line card) and, having selected the line card, then selects an appropriate trace:

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.

Ex1001 [’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.

Ex1001 ['740 Patent], 5:63-66.

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). 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).

Fourth, in the downstream direction, the patent discloses “two mapping operations” that can be performed in a “a single combine mapping operation.” Ex1001 ['740 Patent], 6:60-65. A first mapping operation determines the port and line card and a second mapping operation determines the particular trace through which the frame 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.

Ex1001 ['740 Patent], 6:51-60.

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 (e.g., where selection of a port does not dictate the specific trace). Ex2024 [Gomez Decl.], ¶¶70-71.

Fifth, the patent discloses performing both selections in a single computation precisely because selecting two links (as opposed to selecting only one link) adds “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.

Ex1001 ['740 Patent], 6:61-65. This added complexity 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 discrete selection, the added

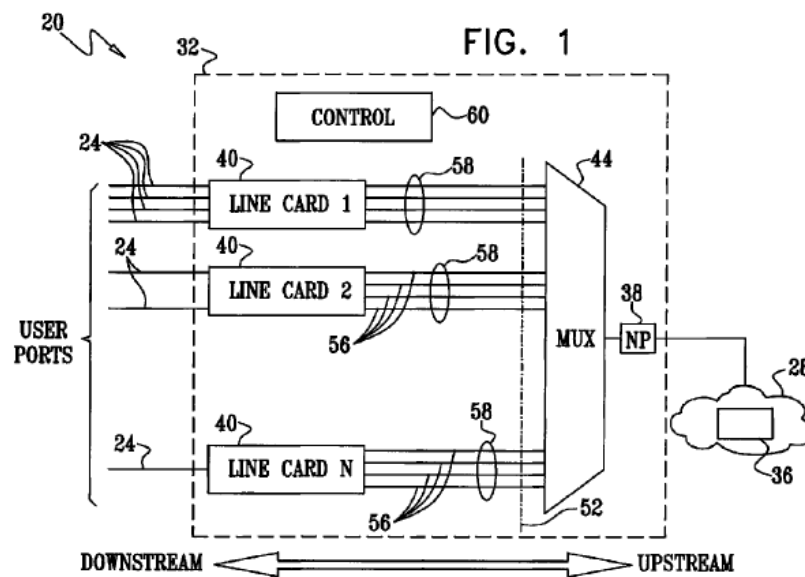
complexity of which is addressed by performing both selections in a single computation.

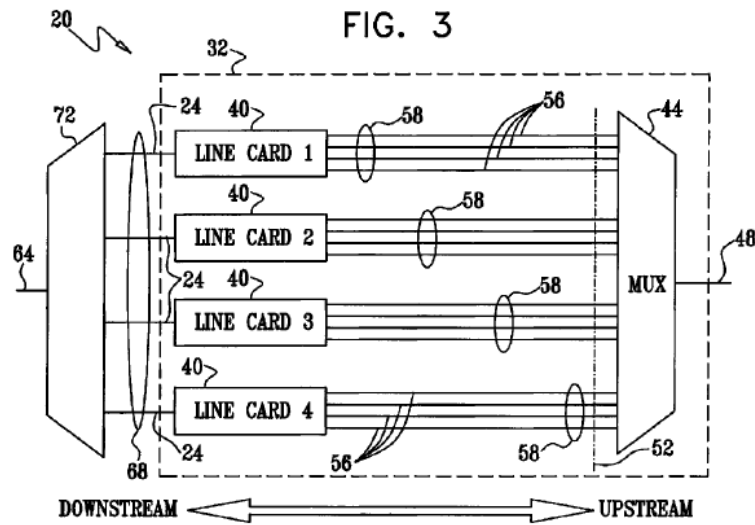
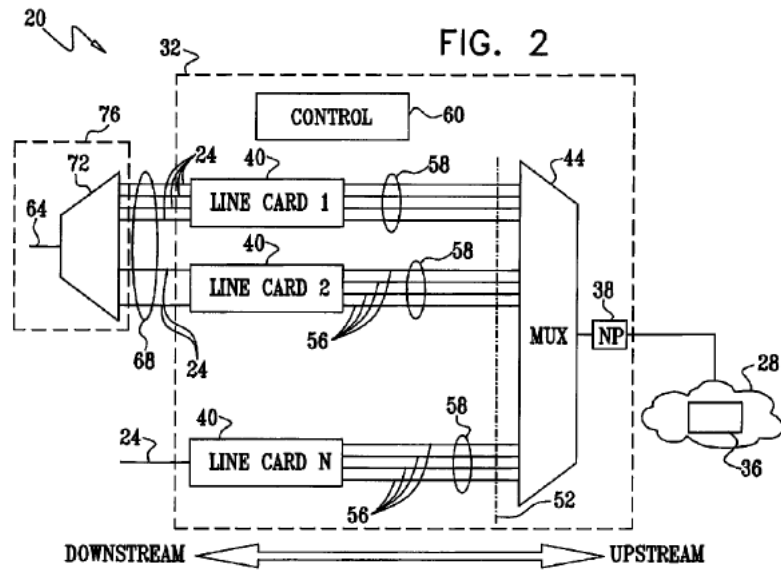
The details of one embodiment of this single computation also illustrate that two selections are performed, not one. The '740 Patent teaches that a single combined mapping operation can be performed, by way of example, with a hashing function that selects “both the backplane trace 56 over which the frame is to be sent to one of line cards 40, and the user port 24 to be used within external LAG group 68.” Ex1001 [’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.

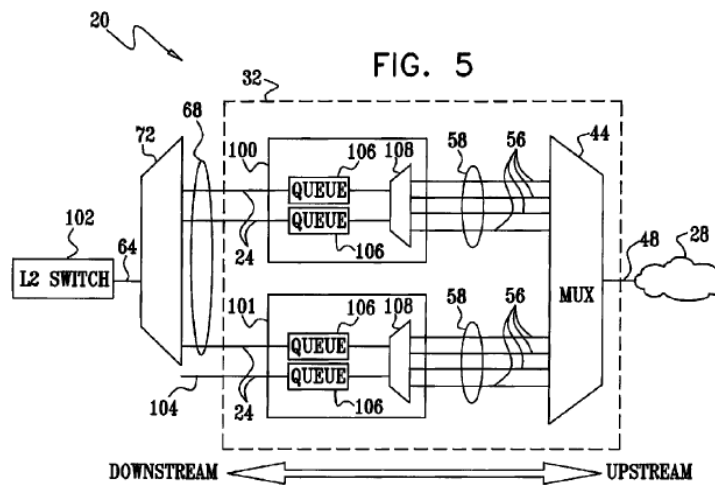
In one embodiment, the hashing function utilizes a hashing size parameter N_{bpow} , with $N_{bpow} = N_{nextp} \times N_{nbpt}$ that corresponds to the product of the number of user ports (“ N_{nextp} ”) to the number of backplane traces (“ N_{nbpt} ”). Ex1001 [’740 Patent], 7:25-30. This hashing parameter accounts for every combination of paths (corresponding to a mapping of ports onto backplane traces) over which a frame may be transmitted. 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 discrete from the selection of ports receiving incoming data. Ex2024 [Gomez Decl.], ¶¶74-75. Indeed, 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. Ex2024 [Gomez Decl.], ¶75.

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 several traces (56):







As can be seen in each figure above, there is no embodiment in which the ports (24) correspond to only a single backplane trace (56). A POSITA would understand from these figures that in every instance, the backplane trace is not determined by the selection of a port. Ex2024 [Gomez Decl.], ¶¶76-77.

These intrinsic statements both independently and “collectively [] amount[] to disavowal” of prior art configurations where each port is fixedly assigned to a specific backplane trace. *Thorner*, 669 F.3d at 1366. Accordingly, 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 selection of the first physical link from the first group such that the first physical link is not fixedly assigned to the second physical link.

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

The asserted references do not teach or suggest the claims of the '740 Patent for a number of reasons discussed in the sections below.

First, each independent claim requires “a second group of second physical links arranged in parallel” or “[two or more/a plurality of] backplane traces arranged in parallel.” Ex1001 ['740 Patent], claims 1, 4, 5, 13, 14, 15, 17, 19, 20, 28-30. As discussed below, the traces from Bruckman that the Petition relies on for these limitations are not arranged in parallel with one another. This argument was not before the Board when it issued its Institution Decision.

Second, independent claims 1, 4, 5 and 13 require “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.” Ex1001 ['740 Patent], claims 1, 4, 5, 13. Independent claims 17, 19, 20 and 28 similarly require “a control module, which is arranged to select for each data frame sent between the communication network and the network node, 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 over which to send the data frame.” Ex1001 ['740 Patent], claims 17, 19, 20, 28. As discussed below, under the proper construction of “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” (which is given *supra* and was not before the Board when it issued its Institution Decision), neither Bruckman nor Basso disclose or render obvious the discrete selection of a second physical link (or “backplane trace”) Patent Owner has provided a claim construction—not before the Board when it decided to institute trial—supported by the expert declaration of Dr. Miguel Gomez showing that Patent Owner’s position is not only consistent with the plain and ordinary meaning of this limitation, but that the intrinsic and extrinsic record requires Patent Owner’s position.

Third, claims 1, 4, 5, 13, 17, 19, 20 and 28 require a “single computation” to perform both selections. As discussed below, neither Bruckman nor Basso disclose or otherwise render obvious first and second links that are selected in two selections, let alone in two selections performed in a single computation.

Fourth, independent claims 14 and 15 require “selecting responsively to at least one of the respective frame attributes a backplane trace from the two or more backplane traces.” Ex1001 [’740 Patent], claims 14, 15. Independent claims 29 and 30 similarly require “a control module, which is arranged to select, for each data frame, responsively to at least one of the frame attributes, a backplane trace from the plurality of backplane traces over which to send the data frame.” Ex1001 [’740 Patent], claims 29-30. Neither Bruckman nor Basso discloses or otherwise renders

these limitations obvious for largely the same reasons as for the limitation requiring discrete selections of a first and of a second physical link in the other independent claims. That is, there is no selection of a second link or backplane trace in Bruckman or Basso because the Bruckman and Basso disclose only selection of a port, and that port is always directly assigned to the same second link.

Finally, as discussed below, the Petition fails to address several limitations in independent claims 29 and 30. Therefore, Petitioner separately fails to bear their burden to prove claims 29 and 30 (and, correspondingly, dependent claim 31) are unpatentable.

For the foregoing reasons, discussed in detail below, the asserted references do not render any claims of the '740 Patent unpatentable.

**A. Bruckman And Basso Do Not Disclose Or Render Obvious
“Coupling Each Of The One or More Interface Modules To A
Communication Network Using A Second Group Of Second
Physical Links Arranged In Parallel”**

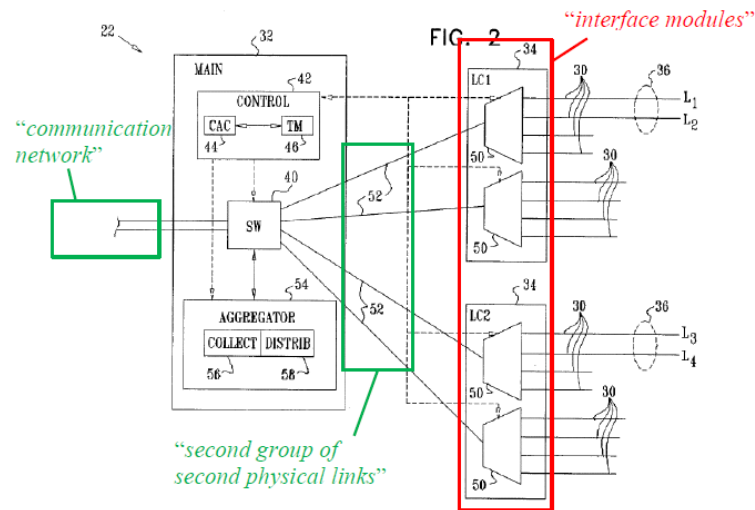
Petitioner incorrectly asserts that Bruckman discloses “line cards 34 (‘one or more interface modules’)” that are coupled to the core network with a “set of parallel traces 52 (‘a second group of second physical links arranged in parallel’).” Pet., 37. Limitation 1.3 requires “coupling each of the one or more interface modules [e.g., line cards] to a communication network using a second group of second physical

links arranged in parallel.”³ Ex1001 [’740 Patent], 11:4-6 Bruckman fails to disclose or render obvious 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*.⁴

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):

³ Independent claims 1, 4, 5, 13, 14, 15, 17, 19, 20 and 28-30 each include corresponding limitations with 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, each claim that depend therefrom.

⁴ Bruckman is the *only* reference upon which Petitioner relies for this limitation; and this argument was *not* previously before the Board.



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

A POSITA would recognize readily that each of the traces 52 corresponds to a different set of links 30 because each trace is connected to a different concentrator 50. Ex2024 [Gomez Decl.], ¶¶81.

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. Ex2024 [Gomez Decl.], ¶¶82-84.

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, the lack of a pre-assigned relationship between (i) the second links that connect the network to the interface module and (ii) the first links that connect the interface module to a user. Ex2024 [Gomez Decl.], ¶85. This structural feature (no fixed relationship between ports and backplane traces) and its purpose are 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 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.

Ex1001 ['740 Patent], 1:66-2:4.

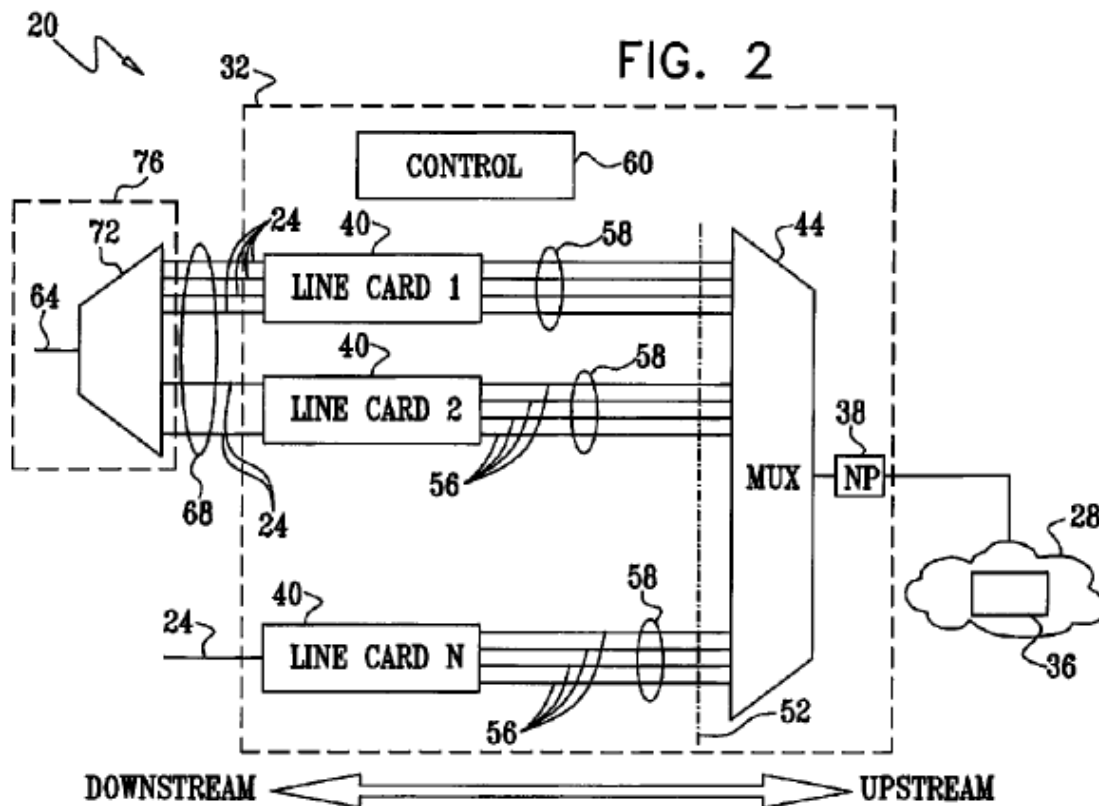
Each LAG group 58 is considered by the relevant line card and by multiplexer 44 to be a single logical link having an aggregated bandwidth (i.e., capacity) equal to the sum of the bandwidths of the individual backplane traces in the group. *As a result, there is no pre-assigned relationship or connection 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. The same structural feature is required by the claims requiring two discrete selections of physical links or a selection of backplane traces, as discussed *infra*. 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.

This understanding of “arranged in parallel” and the lack of a fixed relationship between first and second physical links 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, figure 2 below shows interface modules (line cards 40) that are connected to more than one trace 56 such that either (i) no particular trace 56 is associated to only one port 24 and/or (ii) no particular port 24 is associated to only one trace 56:



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 the MUX 44 and the line cards (e.g., line card 1) permit the backplane traces associated with each of the line cards to connect to the same set of ports (to the left of the figure or downstream) and to the same multiplexer and core network (to the right of the figure

or upstream). Ex2024 [Gomez Decl.], ¶¶87. The same holds true for each of the other groups of backplane traces 58 shown in the same figure.

Cisco's expert, Dr. Houh, testified to this very point, i.e., that a POSITA would understand the '740 Patent's backplane traces to be parallel because they are shown as such in the drawing *and* because they have the *same* relevant start 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.*

...

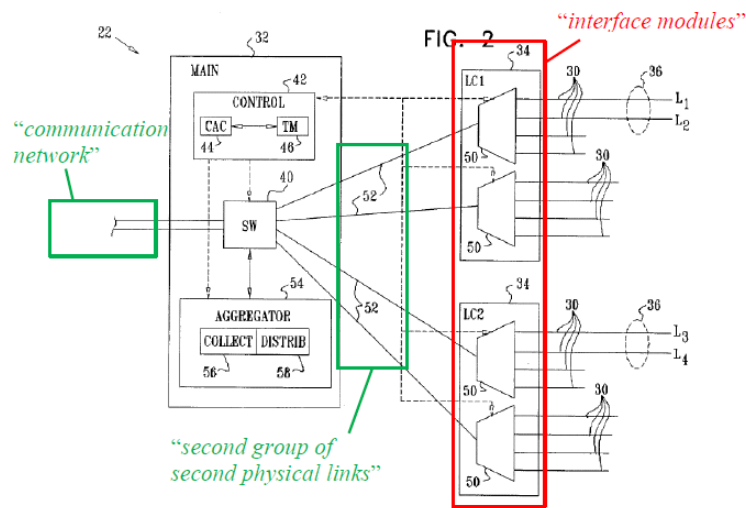
Q. *Does the fact that these four backplane traces all start at the same line card and end at the same multiplexer also suggest that these are parallel backplane traces?*

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.

A POSITA would understand that providing the backplane traces 56 as parallel physical links—*i.e.*, with endpoints defined as (a) the specific component (line card) that connects those traces to a group of ports 24; and (b) the same multiplexer 44—enables a network element “in which there is no direct relationship or connection between user ports and backplane traces.” Ex2024 [Gomez Decl.], ¶89.

Conversely, a POSITA would understand that traces leading to *different* groups of ports, such that the ports (or first links) in each group can only directly connect to a single trace, are not arranged in parallel. Ex2024 [Gomez Decl.], ¶90. This is the case with Bruckman. 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.

Indisputably—and notwithstanding that Bruckman describes traces 52 leading to line cards that have two or more concentrators—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). A POSITA would immediately recognize that the Bruckman traces are going to different places. And as Dr. Houh testified, 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 thus confirms what would have been plain to a POSITA from Bruckman Fig. 2: that Bruckman's traces go to different places 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.

Unable to reconcile this difference between Bruckman and the '740 Patent with their assertion that Bruckman discloses a group of second parallel physical links, Petitioner—and Dr. Houh—attempt to sidestep it by asserting that “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; Ex1003 [Houh Decl.], ¶61 (quoting Ex1005 [Bruckman], ¶[0002])). Though it is not entirely clear either from the Petition or from Dr. Houh's declaration, Petitioner's position appears to be 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. Setting aside that Petitioner has failed to make its position clear in its papers on this critical point, this is simply not accurate.

First, it does not follow logically from the fact that traces can be aggregated—and link aggregation is a technique that may apply to parallel traces—that all aggregable traces are also parallel. Indeed, as Dr. Houh admitted, Bruckman’s reference to link aggregation is not a definition of link aggregation, let alone a restrictive one. Ex2026 [Houh Dep. Tr.], 66:22-70:15. Bruckman’s description of one potential configuration for aggregation would not lead a POSITA to conclude that Bruckman’s traces are arranged as parallel physical links merely because they can be aggregated into a logical link, particularly in light of the indisputable facts that Bruckman’s physical links (a) have different physical endpoints and (b) are even drawn as non-parallel physical links. Ex2024 [Gomez Decl.], ¶92. 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”) does not preclude physical links that are not arranged in parallel—like Bruckman’s traces—from forming part of a single logical link. Ex2024 [Gomez Decl.], ¶92.

Second, though the traces in Bruckman may certainly be part of a *logical link* that consists of multiple traces and links, the structural arrangement of the traces in Bruckman as *physical links*—which is what the claims require here—is simply not in parallel. The claim language is clear that the second links required to be arranged in parallel are (i) “physical” links that connects the interface module to the core network, and (ii) connect through that interface module to a set of ports (or first physical links). A POSITA would thus understand that the relevant endpoints for determining whether the links in the second group are parallel are the endpoints that connect the second physical links to (a) the core network and (b) to the ports. Further, a POSITA would understand that the physical links in the second group must share those relevant endpoints to satisfy the requirement of parallel arrangement. In the ’740 Patent, those endpoints are interface modules that connect the parallel backplane traces to the same ports, and a backplane or multiplexer that connect those traces to the same core network.

Bruckman fails to disclose such an arrangement. Bruckman’s traces only 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). Ex2024 [Gomez Decl.], ¶92. 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.

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 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”

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. Pet., 41-45. Petitioner is wrong.

As explained in detail below, Bruckman and Basso disclose prior art network element architectures in which the first and second links have a predetermined relationship—that is, each port requires the use of a predetermined trace. Such architectures do not allow for two physical link selections, as required by this

limitation. Further, to the extent that Bruckman and Basso even disclose selections of two physical links (they do not), Bruckman and Basso fail to disclose or to render obvious selections of two such links in a “single computation.”

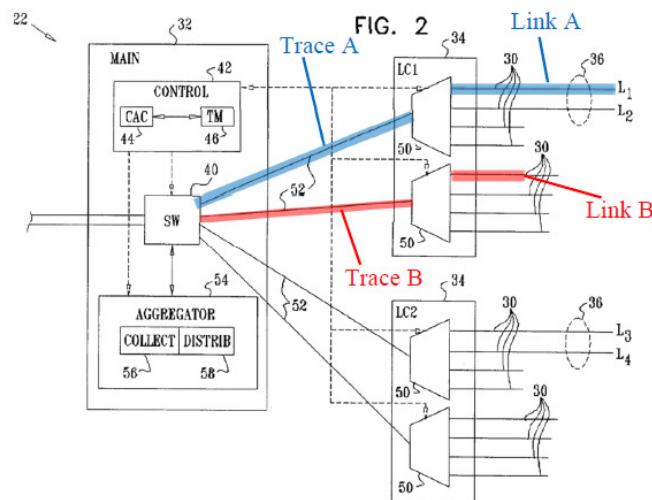
1. Bruckman and Basso Do Not Disclose—Or Render Obvious—the “Selecting, in a Single Computation” Limitation

Petitioner asserts that Bruckman renders obvious the “selecting, in a 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); and (ii) Basso, which describes a prior art element in which—similar to Bruckman—the selection of a port that also governs the selection of the corresponding second physical. As explained in detail below, neither Bruckman nor Basso disclose or otherwise render obvious first and second links that are selected in two selections, let alone in two selections performed in a single computation.

2. Petitioner’s Ground 1 Fails Because Bruckman Does Not Render Obvious the “Selecting ... A Second Physical Link” Limitation

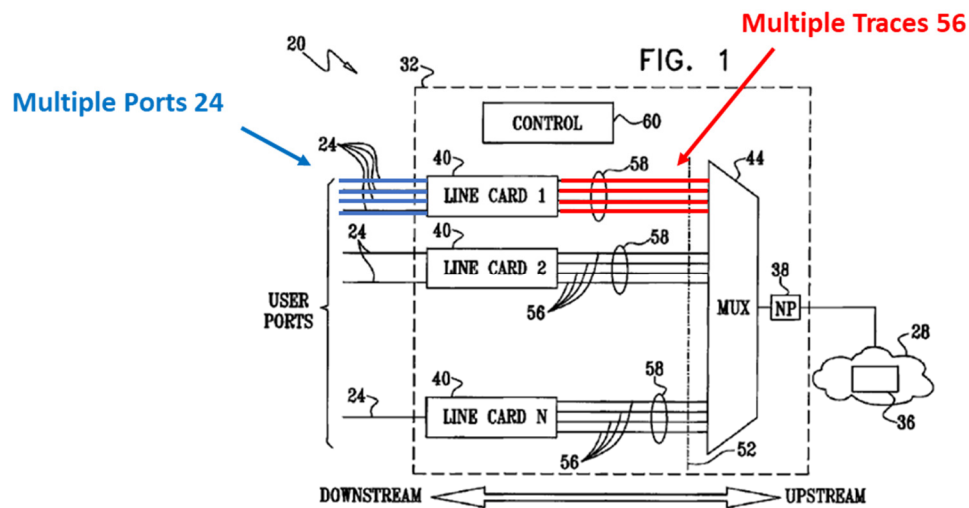
Bruckman fails to disclose two separate selections of a first physical link from a first group and a second physical link from a second group, let alone that those two selections are the product of a single computation.

First, under the proper construction of the term “selecting ... a first physical link out of the first group and a second physical link out of the second group” 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,” Bruckman does not disclose this limitation. In contrast to the ’740 patent (in which the first physical links (e.g., ports) are not fixedly assigned to and 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 specific 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).

Bruckman's configuration is different than the '740 Patent, which provides for a first group of multiple ports 24 that can be associated with a second group of multiple traces 56, as shown in annotated '740 Patent Fig. 1 below:⁵



Indeed, Petitioner admits that “each link 30 is associated with only a single trace 52.” Pet, 43-44. This admission alone dooms Petitioner’s challenge with respect to Bruckman, since Petitioner concedes that the first links (30) are fixedly

⁵ Notably, in the same figure, Line Card N, which only appears to have a single port, also corresponds to multiple traces. Though the claims do not cover a scenario with only a single port, even taking the disclosure of a single-port card at face value, the port on that card still corresponds to multiple traces.

assigned to the second link (trace 52) in Bruckman. Thus, indisputably, Bruckman lacks a key element of the inventions claimed in the '740 Patent and the independent claims.

Second, 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 based on the selection of Bruckman’s link 30 cannot amount to an actual selection of the trace (i.e., the second physical link from the second group of second physical link). This is so because, as discussed above in §III, “selecting a second physical link out of a” “second *group* of second physical links” requires that there be more than one “second physical link” in the second group available to choose from, even if the first link is otherwise selected.

Petitioner’s expert testified to this very point, in particular, that the absence of multiple links (e.g., traces 52 in Bruckman) 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. Dr. Houh’s testimony about not really having a choice (i.e., a selection) as to the links over which to transmit data when there is only one available path for data to traverse mirrors 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. *See* §III, *supra*. A POSITA would thus understand that Bruckman does not disclose “selecting ... a second physical link”.

Third, 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 Bruckman does not disclose the claimed selections in “a single computation.” As also explained *supra*, the “single computation” limitation is aimed at mitigating the complexity of two distinct mapping steps (e.g., of a port and a backplane trace). 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 to mitigate stemming from that second step.

The claims—which require “selecting, in a single computation ... a first physical link out of the first group and a second physical link out of the second group” are dispositive. However, the specification also supports this distinction with disclosures about (i) the lack of direct relationship between the first and second groups of physical links; (ii) the rationale behind providing these groups as separate

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. *See supra*.

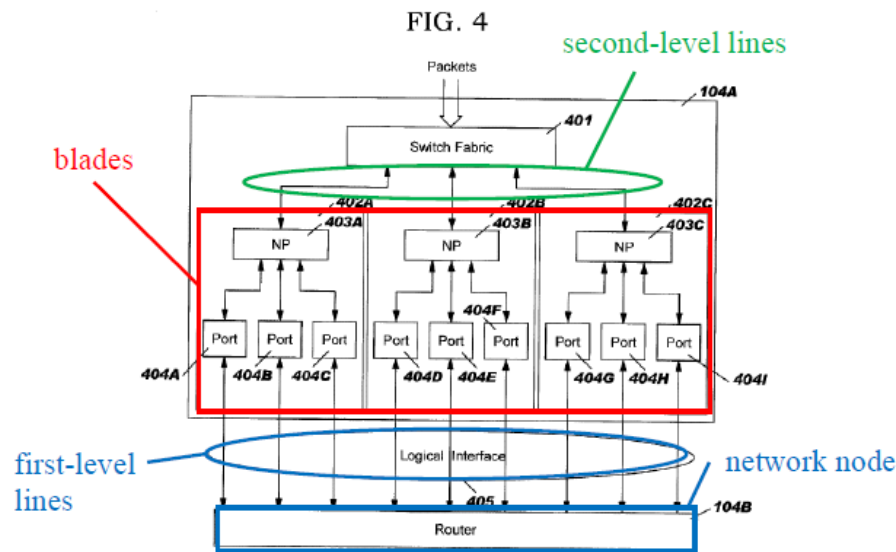
Unlike the '740 Patent, Bruckman (which was assigned to the same assignee as the '740 patent and discloses what is by all appearances an obsolete, less sophisticated network element) discloses a hashing function that does not factor in the available traces, which is further evidence that it does not select a trace as part of the port selection process. Ex2024 [Gomez Decl.], ¶105.

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.”

3. Petitioner’s Ground 2 Likewise Fails Because Basso Likewise Does Not Disclose the “Single Computation” Limitation

Petitioner incorrectly 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. As explained below, Basso fails to disclose the selection of a second physical link out of a second group. Instead, like Bruckman, Basso discloses a computation through which only one link is selected out of a single group.

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 (402A-C) that are connected to the switch fabric and from there to a communication network. Petition at 44.

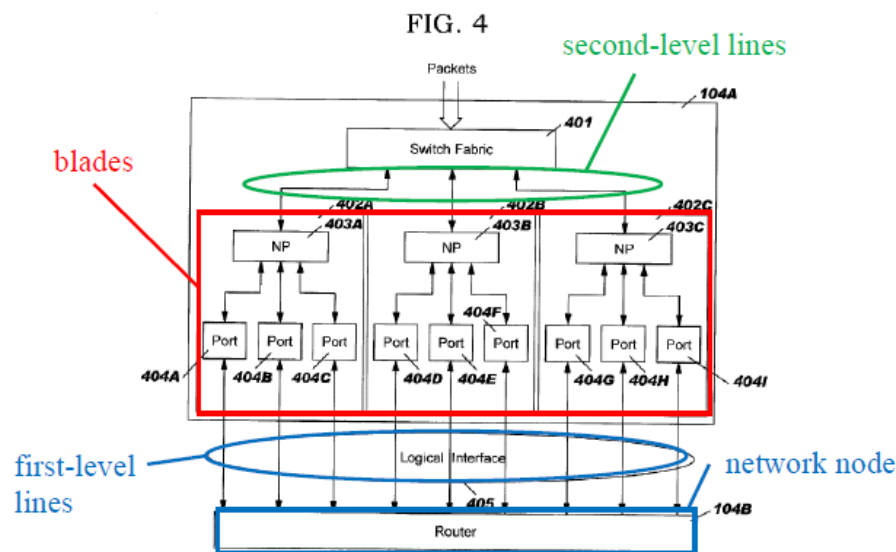


Ex.1006, Fig. 4 (annotated); Ex.1003, ¶82.

Based upon a mistaken presentation of how Basso maps the path of a data frame from the network to the external router, 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.” Petitioner’s description is incorrect

and misleading; but even if it were accurate, it would still not disclose the required selection of a first and second link in a single computation.

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.

Rather, 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 selecting those second-level lines. Given that the blades in Basso are not physical links (Ex2024 [Gomez Decl.], ¶111), as required by the claims, Petitioner's contention that Basso

discloses a selection of a first and second link in a single computation fails on this basis alone.

Second, even if the Board sidesteps Petitioner's failure above and credits Petitioner's contention that a single Basso blade constitutes a second group of multiple physical links (respectfully, the Board should not), Petitioner's argument again fails for the same reasons as those discussed in Bruckman. It is evident from Basso that the purported "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. 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. Ex1006 [Basso], Fig. 6. 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. As explained *supra* in detail, this is fundamentally inconsistent with the claim language and a principal innovation of the '740 patent, in particular, that the first physical links must not be fixedly assigned to the second physical links (and the requirement that both of those links must be selected).

Third, even accepting Petitioner's argument that the selection of a "blade/port" combination constitutes a selection of two links (it does not), Basso still fails to disclose that the selection is done in a single computation and fails for this independent reason as well. In particular, Basso discloses that the hashing function

which Petitioner identifies as the single computation that performs the “blade/port combination” selection occurs only *after* packets have already been directed to a particular blade, as is evident from the following disclosures:

- (i) ***a switch fabric directs incoming packets to particular blades that contain network processors:*** “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.

- (ii) ***the processors determine the port only after receiving the packet previously directed to the blade:*** “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 performed only after the packet is received by the processor and the corresponding blade has been selected:*** “A hash function may then be performed on the received packet to

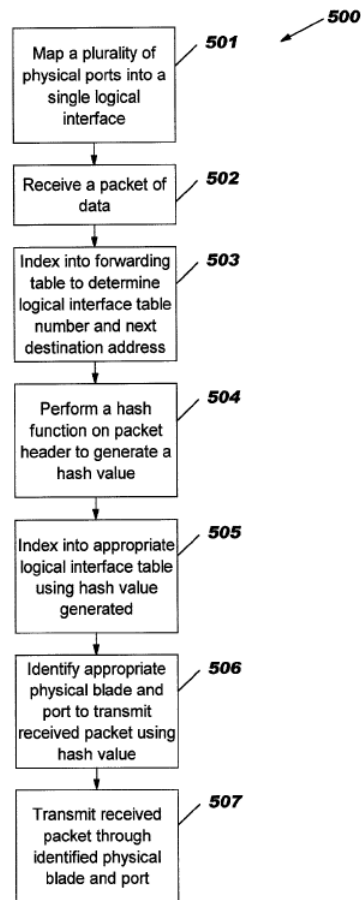
generate a hash value. In one embodiment, a hash function may be performed on the source and destination address in the packet header to generate a hash value.”

Ex1006 [Basso], 0011.

A POSITA would readily understand from these disclosures that the blades—to the extent even selected—are determined by the switch fabric, *i.e.*, before the network processor even performs the disclosed hashing operation used to determine an appropriate port. It is only after the switch fabric determines a blade that the network processor selects a port. Thus, the blade and port are not selected in a single computation, notwithstanding that Basso uses the shorthand phrase “blade/port combination” to describe these components (*i.e.*, the blade and the port that is part of the blade).

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. First, 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. Next, 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. Notably, the “network processor” is part of a blade. *See, e.g.*, Ex1006 [Basso], Fig. 4. Thus, at step 502, the blade has already been determined, since the network processor has already received the packet. It is only after this step that the network processor determines the next “hop” for the packet:

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. And it is only after step 503—when the blade and corresponding network processor have been determined—that 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. And, the so-called “blade/port combination” is only identified 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.

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, a POSITA would understand that the phrase “blade/port combination” simply refers to the fact that each blade may have several ports, not that the blade is selected separately from the port, let alone in a single computation. Ex2024 [Gomez Decl.], ¶¶112-114.

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”

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.” Ex1001 [’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.

The Board preliminarily found that these claims do “not require selection between two or more backplane traces that is independent or distinct from selection of a physical link/user port.” DI, 35-36.

Patent Owner respectfully submits that 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 backplane traces. Instead, they disclose selecting a user port; and it is only after a port is selected that a second link or trace is determined based on that port, not selected. *See* §§IV.B, C, *Supra*. Indeed, each user port indisputably maps solely to a *single* trace in Bruckman (or blade in Basso); thus, there is no selection of backplane traces as expressly required by the language of the claims. *See, e.g.*, Ex2027 [Merriam-Webster] (“Select: chosen from a number or group by

fitness or preference.”). Moreover, as discussed *supra*, the first links in Bruckman and in Basso are fixedly assigned to the traces in those references; thus, they do not disclose selecting backplane traces for this additional reason.

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” (Ex1001 [’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.

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.

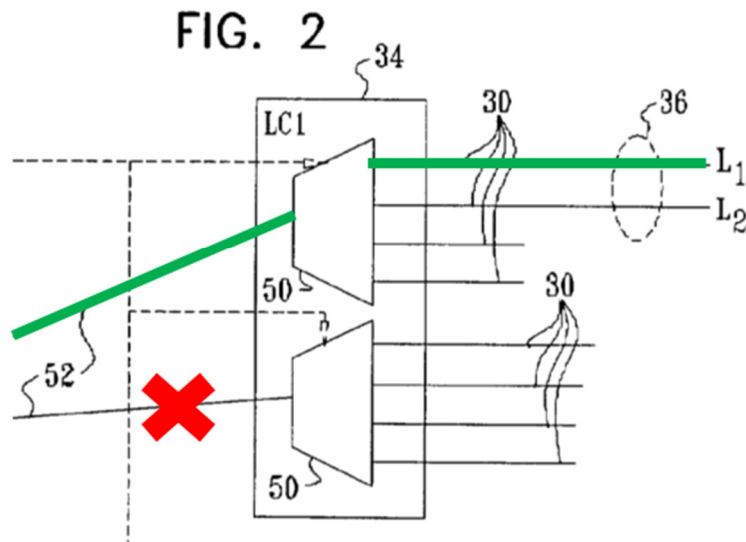
The Petition admits that “Bruckman provides limited description of how the hash computation is used to select a trace.” Pet., 42-43. That is because Bruckman’s

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*, §IV.B; 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 single trace 52 that corresponds to physical link 30 (*Id.*), and Basso must use the single blade 403 that corresponds to a port 404, there is no selection of a trace.

Put another way, claims 14-16 and 29-31 require selecting a backplane trace from “two or more backplane traces” that may correspond to the same port or group of ports, since those traces link to the same interface modules as such port. Ex1001 [’740 Patent], claims 14-16, 29-31. Bruckman does not disclose such a configuration. 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. Ex1005 [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.

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.



This is different from claim 14 and the '740 patent, where multiple ports and multiple traces are each connected to an interface module and the interface module. *See, e.g.,* Ex1001 ['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.

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 (or trace) (*see supra*, §I.A), since the blade used corresponds directly to the port selected. *Id.* Thus, for reasons similar to Bruckman, 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.

Moreover, the backplane trace must be selected “responsively to at least one of the respective frame attributes.” *Id.* The Petition completely fails to 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 Claim 29 Obvious

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.

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.

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.

Petitioner bears the burden to prove unpatentability. 35 U.S.C. § 316(e). “[T]hat burden never shifts to the patentee.” *FanDuel, Inc. v. Interactive Games LLC*, 966 F.3d 1334, 1341 (Fed. Cir. 2020). “[T]he *petitioner’s* contentions ... define the scope of the litigation all the way from institution through to conclusion.” *SAS*

Inst. Inc. v. Iancu, 138 S. Ct. 1348, 1357 (2018) (emphasis added). Because the Petition fails to explain why Bruckman discloses this limitation, Petitioner cannot bear its burden. And in any event, as explained *supra*, Bruckman fails to disclose traces that are arranged in parallel. Accordingly, Petitioner has not shown claim 29 is unpatentable.

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

Petitioner 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).

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 renumbers 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.

The Petition is required to include “[a] full statement of the reasons for relief requested, including a detailed explanation of the significance of the evidence including material facts,” 37 C.F.R. § 42.22(a)(2), which must include a statement of “[h]ow the construed claim is unpatentable.” *Id.* § 42.104(b)(4). “The petition must specify where each element of the claim is found in the prior art patents or printed publications relied upon.” *Id.* By failing to address entire claim limitations, Petitioner fails its obligation to specify where each element of the claim is found in the prior art. Because Petitioner completely fails to satisfy its burden with respect to these limitations, the Board must hold claims 29 and 30 not unpatentable.

V. CONCLUSION

For the reasons set forth above, Petitioner has not met its burden of proving claims 1-31 of the ’740 Patent are unpatentable by a preponderance of the evidence. The Board should therefore issue a final written decision finding claims 1-31 patentable.

Respectfully submitted,

/ Stephen P. McBride /

Stephen P. McBride, Reg. No. 78,396
CARMICHAEL IP, PLLC

Date: December 15, 2023

CERTIFICATE OF COMPLIANCE WITH TYPE-VOLUME LIMITS

This Patent Owner's Response (the "POR") consists of 13,679, excluding table of contents, table of authorities, certificate of service, this certificate, or table of exhibits. The POR complies with the type-volume limitation of 14,000 words as mandated in 37 C.F.R. § 42.24. In preparing this certificate, counsel has relied on the word count of the word-processing system used to prepare the paper (Microsoft Word).

Respectfully submitted,

/ Stephen P. McBride /

Date: December 15, 2023

CERTIFICATE OF SERVICE

The undersigned hereby certifies that the following documents were served
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PATENT OWNER'S RESPONSE

EXHIBITS 2024-2032

The names and email addresses of the parties being served are as follows:

Theodore M. Foster	ipr.theo.foster@haynesboone.com
David L. McCombs	David.mccombs.ipr@haynesboone.com
Gregory P. Huh	Gregory.huh.ipr@haynesboone.com
Calmann J. Clements	Calmann.clements.ipr@haynesboone.com

Respectfully submitted,

/Stephen P. McBride/

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