

Cisco Systems, Inc., v. Portsmouth
Network Corporation

PATENT OWNER
Portsmouth's
PRESENTATION

Inter Partes Review of
U.S. Patent No. 7,596,088

IPR2024-01450

1

Petitioner's Grounds

Ground	Claims	Basis - 35 U.S.C. § 103 (Pre-AIA) over:
#1	1-4, 6, 8-11, 13, 15-20	Dziong and Sathyanath
#2	7, 14	Dziong, Sathyanath, and Jensen

Roadmap

Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

*Dziong +
Sathyanath*

- Cited references operate in a fundamentally different way from the invention disclosed in the '088 Patent
- Cited art fails to teach limitations relating to “allocating” bandwidth to the new connection. ([1.2]-[1.3], [8.4]-[8.5], [15.6]-[15.7], [17.3]-[17.4])

Ground 2

Dependent claims 7 & 14

*Dziong +
Sathyanath +
Jensen*

- Cited references operate in a fundamentally different way from the invention disclosed in the '088 Patent
- Cited art fails to teach limitations relating to “allocating” bandwidth to the new connection. ([1.2]-[1.3], [8.4]-[8.5], [15.6]-[15.7], [17.3]-[17.4])

Roadmap

Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

Dziong + Sathyanath

The Invention of the '088 Patent Teaches Sharing Bandwidth Between Existing Connections

U.S. Patent No. 7,596,088

(12) **United States Patent**
Agmon et al.

(10) Patent No.: **US 7,596,088 B2**
(45) Date of Patent: **Sep. 29, 2009**

(54) **ROUTE SELECTION WITH BANDWIDTH SHARING OPTIMIZATION OVER RINGS**

(75) Inventors: **Gideon Agmon, Kfar-Sava (IL); Yossi Barsheshet, Ashdod (IL)**

(73) Assignee: **Corrigent Systems Ltd., Tel Aviv (IL)**

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 91 days.

(21) Appl. No.: **11/039,148**

(22) Filed: **Jan. 24, 2006**

(65) **Prior Publication Data**
US 2007/0171832 A1 Jul. 26, 2007

(51) **Int. Cl.**
H04L 3/14 (2006.01)

(52) **U.S. Cl.** **370/230; 370/229; 370/328; 370/338; 370/400**

(58) **Field of Classification Search** **370/238; 370/404; 230, 395.5, 328, 338**
See application file for complete search history.

(56) **References Cited**
U.S. PATENT DOCUMENTS

5,634,006 A 5/1997 Baugher et al.
6,147,991 A 11/2000 Kloth et al.
6,151,297 A 11/2000 Congdon et al.
6,314,110 B1 11/2001 Chin et al.
6,507,577 B1 1/2003 Manger et al.
6,522,627 B1 2/2003 Manger et al.
6,553,029 B1 4/2003 Alexander
6,665,273 B1 12/2003 Goguen et al.
6,735,198 B1 5/2004 Elzaid et al.
6,778,494 B1 8/2004 Manger et al.
6,785,226 B1 8/2004 Ottman et al.
6,786,681 B1 9/2004 Herten et al.
6,795,304 B1* 9/2004 Swiakowski et al. 370/222
6,952,395 B1 10/2005 Maschman et al.
7,035,279 B2 4/2006 Brockman et al.

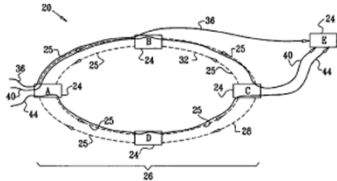
OTHER PUBLICATIONS
The IEEE Standard 802.17 working group, available at www.802.17.org/17.

(Continued)
Primary Examiner—Kevin C Harper
Assistant Examiner—Henry Baran
(74) Attorney, Agent, or Firm—Dorby & Dorby P.C.

(57) **ABSTRACT**

A method for establishing a connection through a communication network that includes multiple segments includes providing a sharing definition defining a sharing of bandwidth among connections in the network. Two or more candidate routes for a new connection to be established through the network are identified. For each of the two or more candidate routes, a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route is calculated responsively to the sharing definition. A preferred route having a minimum value of the cumulative additional bandwidth reservation is selected out of the two or more candidate routes. The new connection is established using the preferred route.

20 Claims, 2 Drawing Sheets



Ex.1001 / Page 1 of 10
CISCO SYSTEMS, INC.

(12) **United States Patent**
Agmon et al.

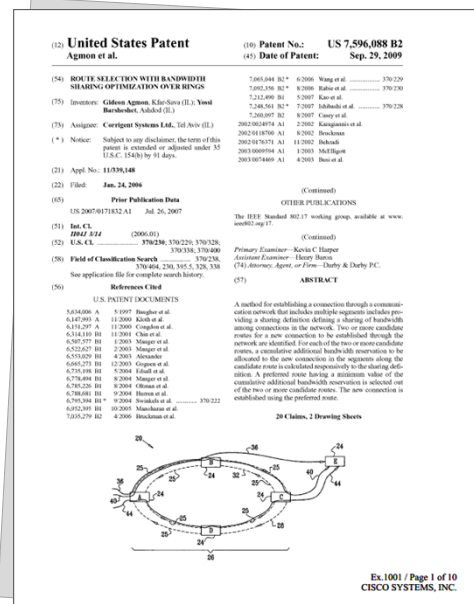
(10) Patent No.: **US 7,596,088 B2**
(45) Date of Patent: **Sep. 29, 2009**

(54) **ROUTE SELECTION WITH BANDWIDTH SHARING OPTIMIZATION OVER RINGS**

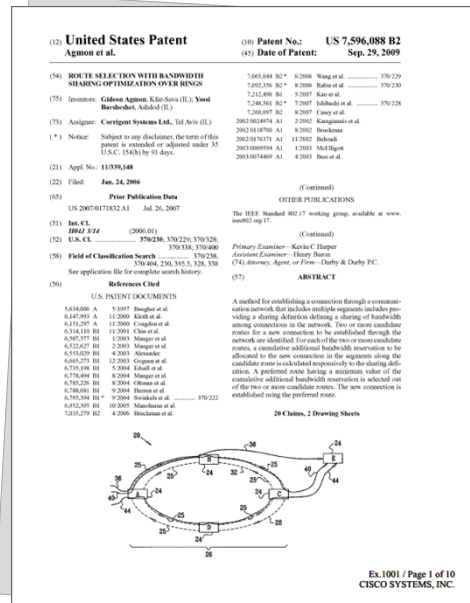
(75) Inventors: **Gideon Agmon, Kfar-Sava (IL); Yossi Barsheshet, Ashdod (IL)**

(73) Assignee: **Corrigent Systems Ltd., Tel Aviv (IL)**

U.S. Patent No. 7,596,088 – Independent Claim 1

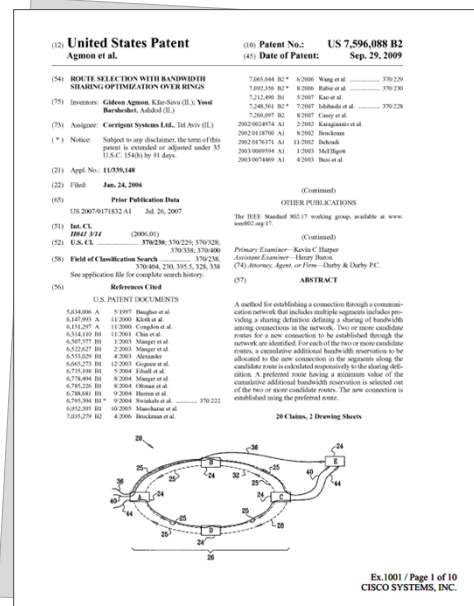


U.S. Patent No. 7,596,088 – Independent Claim 15



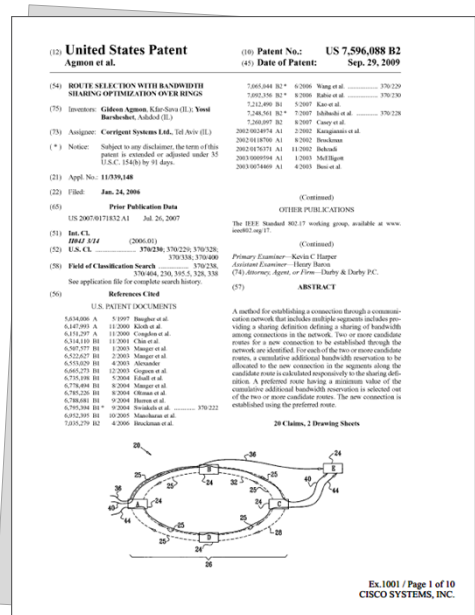
15. A communication network, comprising:
a plurality of network segments;
a network node, comprising:
a network interface, which is arranged to communicate with other nodes in the network; and
a processor, which is arranged to identify two or more candidate routes for a new connection having a requested bandwidth to be established through the network, to accept a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment, to calculate for each of the two or more candidate routes a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition, to select a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes, and to establish the new connection using the preferred route.

U.S. Patent No. 7,596,088 – Independent Claim 17



17. A computer software product used in a network node in a communication network that includes multiple segments, the product comprising a tangible storage medium, in which program instructions are stored, which instructions, when read by a computer, cause the computer to identify two or more candidate routes for a new connection having a requested bandwidth to be established through the network, to accept a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment, to calculate for each of the two or more candidate routes a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition, to select a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes, and to establish the new connection using the preferred route.

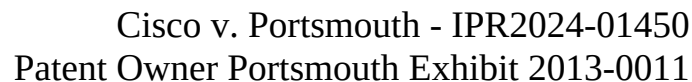
The '088 Patent Teaches Bandwidth Sharing Between Existing, Established Connections



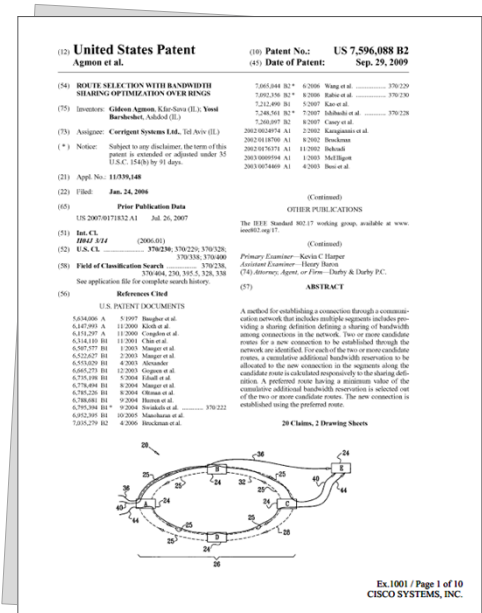
network are identified. For each of the candidate routes, the disclosed methods and systems calculate the additional bandwidth reservation, accumulated over the network segments along the candidate route in question, which would be allocated to the new connection if it were established through this route.

The cumulative additional bandwidth reservation can be viewed as a measure of the amount of bandwidth that can be saved in a particular route due to bandwidth sharing. The candidate route having a minimum value of the cumulative additional bandwidth reservation is selected as a preferred route for establishing the new connection. Using the methods

IPR2024-01450 – '088 Patent (Ex. 1001) at 3:4-10 Sur-Reply at 12

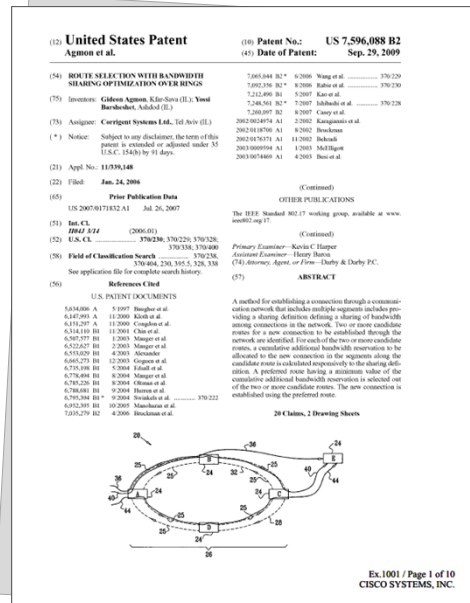


The '088 Patent Distinguishes Itself From Prior Art that Did Not Consider Bandwidth Sharing Between Existing Connections



available bandwidth. These known protocols generally do not take into account dependencies between the newly-established connection and previously-existing connections, such as the ability to share bandwidth allocation between the connections. Some known reservation protocols, such as RSVP-TE and LDP cited above, also do not enable sharing the bandwidth allocation among different connections.

The Claims Require Bandwidth Sharing Between Existing, Established Connections



The invention claimed is:

1. A method for establishing a connection through a communication network that includes multiple segments, comprising:

identifying two or more candidate routes for a new connection having a requested bandwidth to be established through the network;

providing a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection, such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment;

for each of the two or more candidate routes, calculating a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition; selecting a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes; and establishing the new connection using the preferred route.

Roadmap

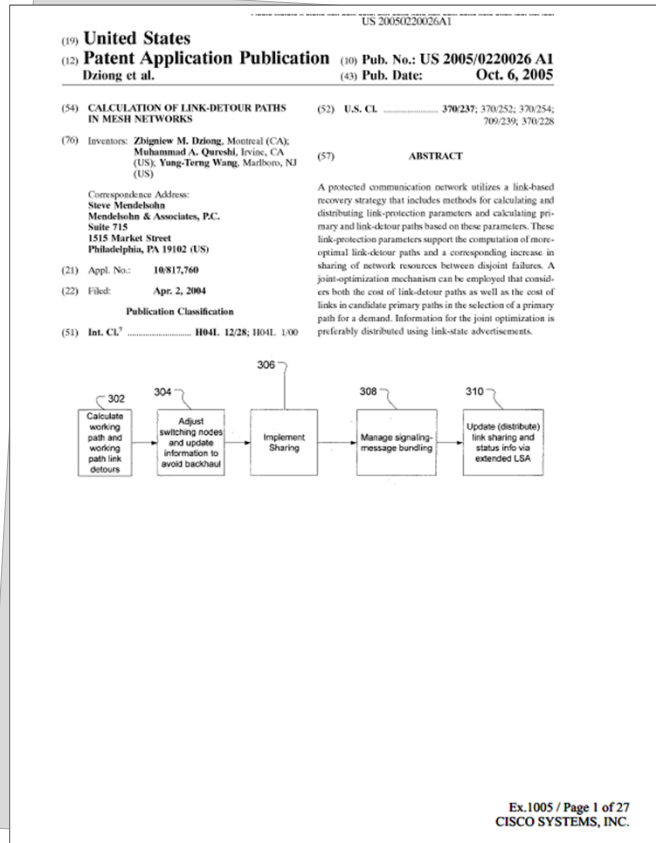
Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

Dziong + Sathyanath

***Dziong and Sathyanath Do Not Teach a
“Sharing Definition” as
Claimed by the '088 Patent***

U.S. Patent Pub. No – 2005/0220026 Dziong



(19) **United States**
(12) **Patent Application Publication** (10) Pub. No.: **US 2005/0220026 A1**
(43) Pub. Date: **Oct. 6, 2005**

(54) **CALCULATION OF LINK-DETOUR PATHS
IN MESH NETWORKS**

(76) Inventors: **Zbigniew M. Dziong**, Montreal (CA);
Muhammad A. Qureshi, Irvine, CA
(US); **Yung-Terng Wang**, Marlboro, NJ
(US)

Ex.1005 / Page 1 of 27
CISCO SYSTEMS, INC.

U.S. Patent Pub. No – 2005/0220026 Sathyanath

(19) United States
(12) Patent Application Publication (10) Pub. No.: US 2004/0190445 A1
Dziong et al. (43) Pub. Date: Sep. 30, 2004

(54) RESTORATION PATH CALCULATION IN
MESH NETWORKS

(76) Inventors: Zbigniew M. Dziong, Montreal (CA);
Ajay Sathyanath, Woodbridge, NJ
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(21) Appl. No.: 10/673,857

(22) Filed: Sep. 26, 2003

Related U.S. Application Data

(60) Provisional application No. 60/459,163, filed on Mar.
31, 2003.

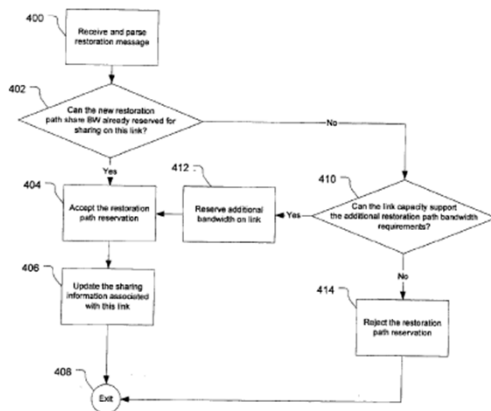
Publication Classification

(51) Int. Cl.⁷ G08C 15/00

(52) U.S. Cl. 370/225, 370/252

ABSTRACT

A method for determining a restoration path corresponding to a primary path for a new service in a mesh network involves (1) generating path costs for candidate restoration paths for the new service, and (2) selecting, for the new service, the restoration path with the lowest path cost, where generating the path cost involves (a) determining, for each link Li in the candidate restoration path, a set B-Li-set of links protected by Li (b) determining, for each link Li, a set I-Li-set of links in the set B-Li-set that are also in the primary path (c) calculating, for each link Li, a link cost based on the set B-Li-set and the set I-Li-set, and (d) calculating the path cost based on a sum of the link costs. In some embodiments, the method includes an efficient scheme for representing, disseminating, storing, and updating sharing information in an OSPF-TE protocol context.



(19) United States

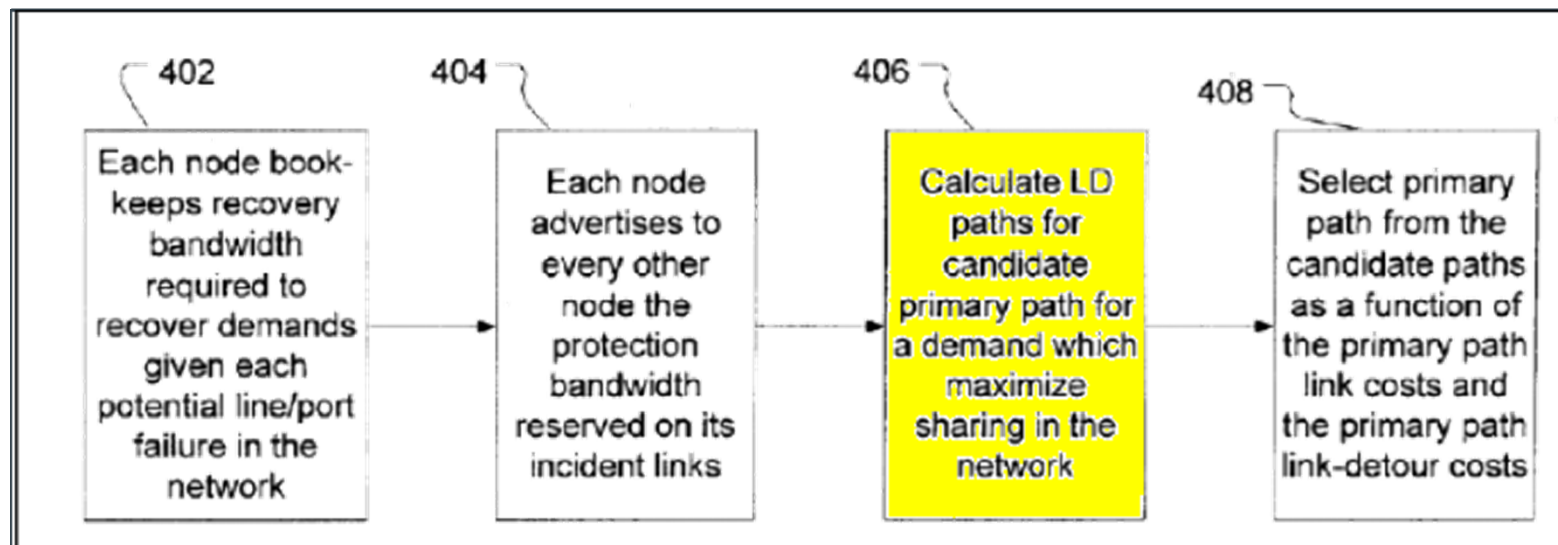
(12) Patent Application Publication (10) Pub. No.: US 2004/0190445 A1
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(54) RESTORATION PATH CALCULATION IN
MESH NETWORKS

(76) Inventors: Zbigniew M. Dziong, Montreal (CA);
Ajay Sathyanath, Woodbridge, NJ
(US)

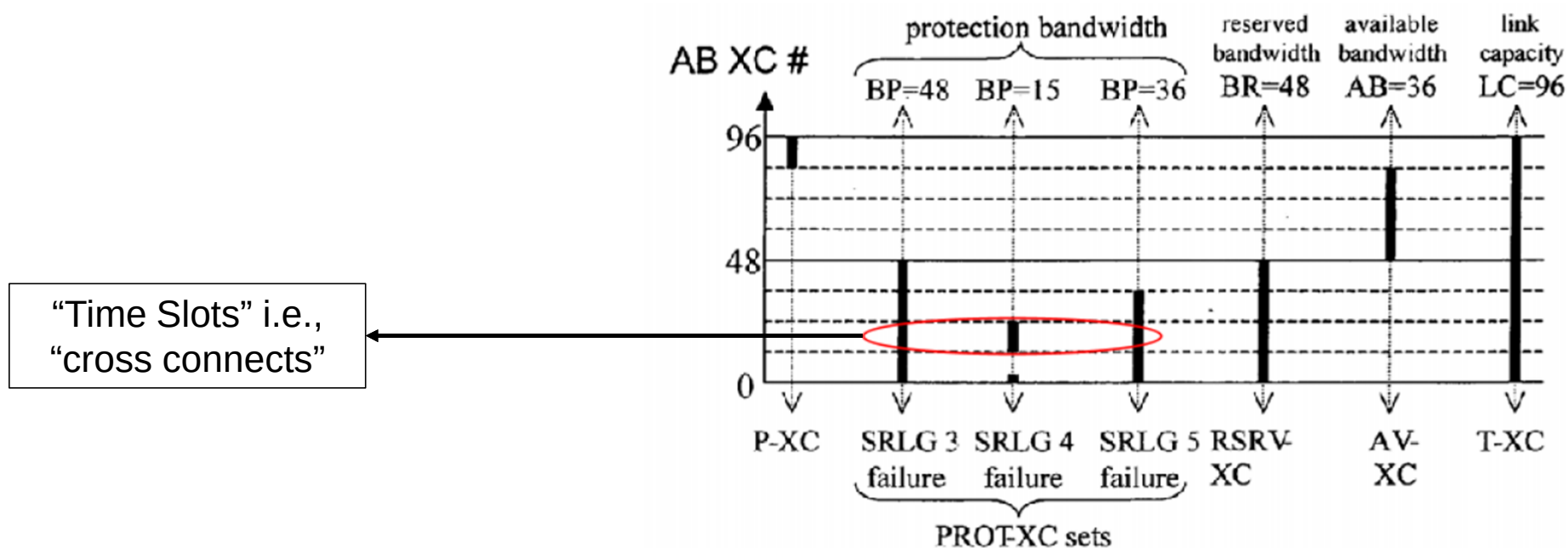
Dziong Does Not Teach *Establishing* a New Connection

The “link detour” path in Dziong is merely *calculated* but not established



Dziong's Fig. 6 Confirms that Link Detour Paths are NOT Established

Established optical paths cannot occupy the same physical resource, thus, the shared “protection bandwidth” in Figure 6 does not represent established paths



Dziong's "Protection Paths" Do Not Share Bandwidth with Existing Connections

[0059] Link-Protection Path Calculation

[0060] In embodiments of the present invention, link-detour path calculation involves maximizing sharing of link-detour bandwidth. The recovery-path calculation algorithm makes use of information including how much bandwidth can be-shared at each link in the network. This information is obtained by advertising, across the network, the amount of bandwidth reserved for recovery on each link and by bookkeeping, in each node, information about all recovery paths that would be activated when a protected link fails.

Bandwidth Sharing in Dziong is Limited to the Sharing of Reserved and Unallocated Bandwidth

41. This aligns with the primary purpose of Dziong's invention, which is to set aside a certain bandwidth pool that can be tapped into in the event an existing connection fails. Because this bandwidth is not actually allocated to any active connection, it exists in a fluid state and can be shared between connections in the event of a failure.

Sathyanath Explicitly Provides that its “Restoration Paths” are NOT Established

have common elements in their primary paths. Note that in case of shared restoration, the source first establishes a pre-computed restoration path and then switches the traffic to it. For achieving sharing in optical networks, one would use shared restoration as opposed to shared protection because an established optical path physically occupies resources such as time slots, wavelengths and thus does not allow their sharing until they are released by deleting the optical path.

Sathyanath Explicitly Provides that its Bandwidth Sharing is Limited to Reserved Bandwidth

but is, instead, only reserved. If the bandwidth were allocated in advance of a failure, this would correspond, in the parlance of the field of protection and restoration for optical transport networks, to a 1:1 protection scheme. If the bandwidth were not only allocated, but additionally if a copy of the service path's data were to be duplicated to the protection path, this would correspond to a 1+1 protection scheme.

However, in preferred embodiments of this invention, the protection bandwidth is not allocated until after the detection of a failure. Thus, in such implementations, this unallocated bandwidth might be used for "opportunistic" data, e.g., data that has a lower guaranteed quality of service (QoS) than the protected traffic. Further, because the protection bandwidth is only reserved and not allocated, "sharing" can be supported, as defined below.

Dziong and Sathyanath Do Not Teach a “Sharing Definition” as Claimed by the ’088 Patent

Thus, Dziong and Sathyanath neither separately nor together teach the “sharing definition” as contemplated by the ’088 Patent. As discussed above, this is because the purpose of these patents and the network configurations within which they operate are fundamentally different from the invention disclosed in the ’088 Patent. *See Supra* Sections V.A-V.B. The ’088 Patent seeks to maximize efficiency in a network by allowing existing connections to share bandwidth with new connections, whereas Dziong and Sathyanath are directed to allowing existing connections to share a pool of bandwidth in case of a failure. These processes are not the same, and Petitioner fails to reconcile these differences.

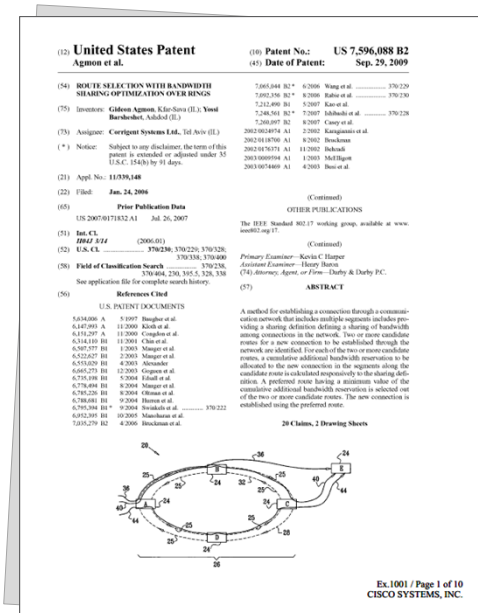
Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

Dziong + Sathyanath

Dziong and Sathyanath Do Not Render Obvious Dependent Claims 4, 11 and 20

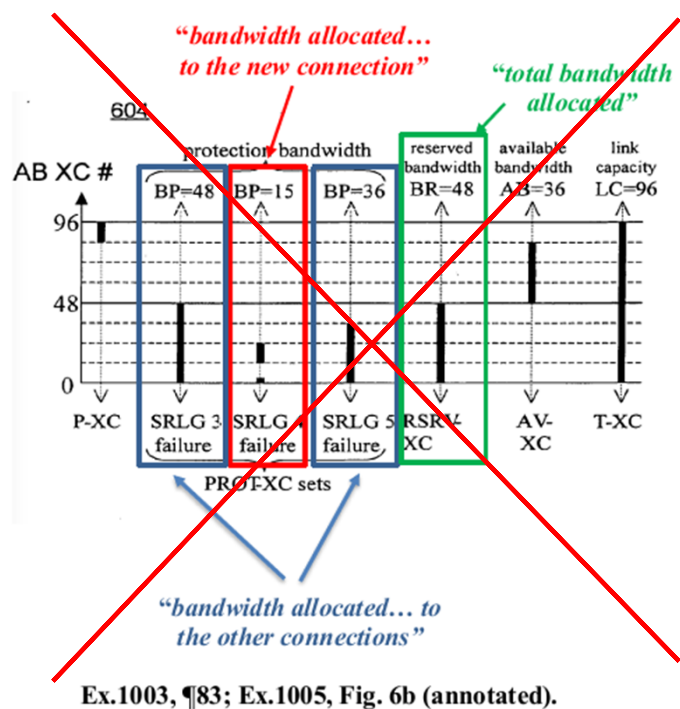
Exemplary Claim 4



4. The method according to claim 1, wherein the new connection and at least one of the other connections specified in the sharing definition traverse at least one common segment along the preferred route, and wherein establishing the new connection comprises allocating the maximum of the requested bandwidth and of the bandwidths of the at least one of the other connections in the at least one common segment to the new connection and to the at least one of the other connections.

Cited Prior Art Does Not Teach Established Connections Sharing a Common Segment

SLRG4 is **NOT** a new connection as claimed by Petitioner



preferred route.” Pet., 57. As an initial matter, Dziong does not teach the establishment of a “new connection,” the treatment of SRLG 4 as a “new connection” is entirely fabricated by Petitioner’s expert. Ex. 1003, 38; Ex. 2010, 69:9-16. Furthermore, SRLG3, SRLG4 and SRLG5 not protection paths but instead are link groups which can individually fail resulting in the activation of multiple protection paths. Ex. 2008, ¶¶51-52, 67; *see also*, Ex. 2012, 181. As taught by Dziong, these protection paths are not activated unless there is a failure on the primary working path. Ex. 1005, [0089]-[0090]. These unestablished protection paths do not share reserved bandwidth with the working path on link AB as taught by the ’088 Patent, but rather share reserved bandwidth with each other. Ex. 2008,

Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

Dziong + Sathyanath

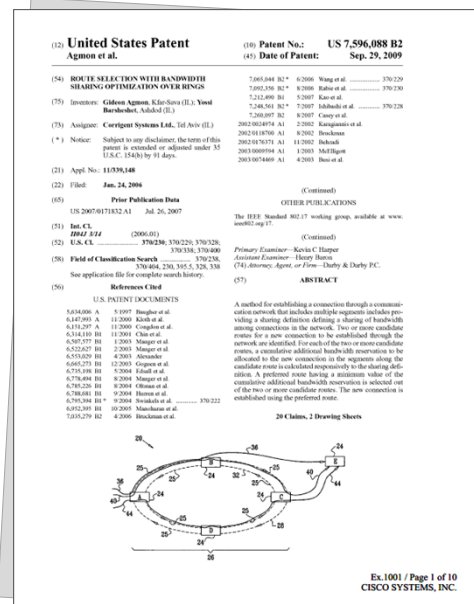
Petitioner's Claim Constructions Misinterpret Patent Owner's Arguments and Claim Terms

“New Connection” and “One or More Existing Connections”

Patent Owner Seeks To Apply The Plain And Ordinary Meaning To The Term “Connection”

Contrary to Petitioner’s incorrect strawman assertion, Patent Owner does not dispute that the term “connection” can include connections that provide failure protection. The distinction that Patent Owner seeks to make, that Petitioner disregards, is that the “new connection” claimed by the ’088 Patent is an *established* connection rather than one that is merely calculated but not actually set up. A POSITA would understand that calculating a path is entirely different than establishing one. Ex. 2008, ¶39. The first step in establishing a path is the path calculation, which is then followed by the signaling phase where the path is established. *Id.* Petitioner and its expert fail to acknowledge this nuance.

The '088 Patent Requires that the “New Connection” is Established



The invention claimed is:

1. A method for establishing a connection through a communication network that includes multiple segments, comprising:

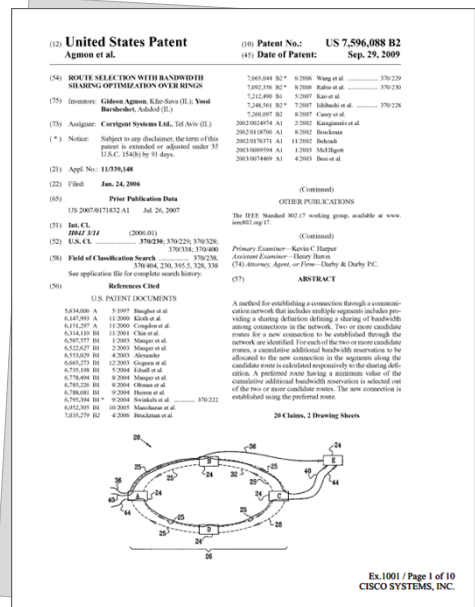
identifying two or more candidate routes for a new connection having a requested bandwidth to be established through the network;

providing a sharing definition specifying one or more other connections, which have respective bandwidths and which are permitted to share a bandwidth allocation with the new connection, such that a total bandwidth allocated jointly to the new connection and to the other connections in any given segment is equal to a maximum of the requested bandwidth and of the bandwidths of the other connections in the given segment;

for each of the two or more candidate routes, calculating a cumulative additional bandwidth reservation to be allocated to the new connection in the segments along the candidate route, responsively to the sharing definition; selecting a preferred route having a minimum value of the cumulative additional bandwidth reservation out of the two or more candidate routes; and

establishing the new connection using the preferred route.

The '088 Patent Teaches That the “One or More Other Connections” Are Established Connections



In yet another embodiment, the sharing definition states that the new connection may share the bandwidth with an existing connection traversing at least one common segment along the preferred route, and establishing the new connection includes sharing a bandwidth allocation in the at least one common segment between the new connection and the existing connection.

“bandwidth allocation” and “total bandwidth allocated”

Petitioner's Interpretation of the Disputed Term as Encompassing "Reserved Bandwidth" Improperly Broadens the Claim Term

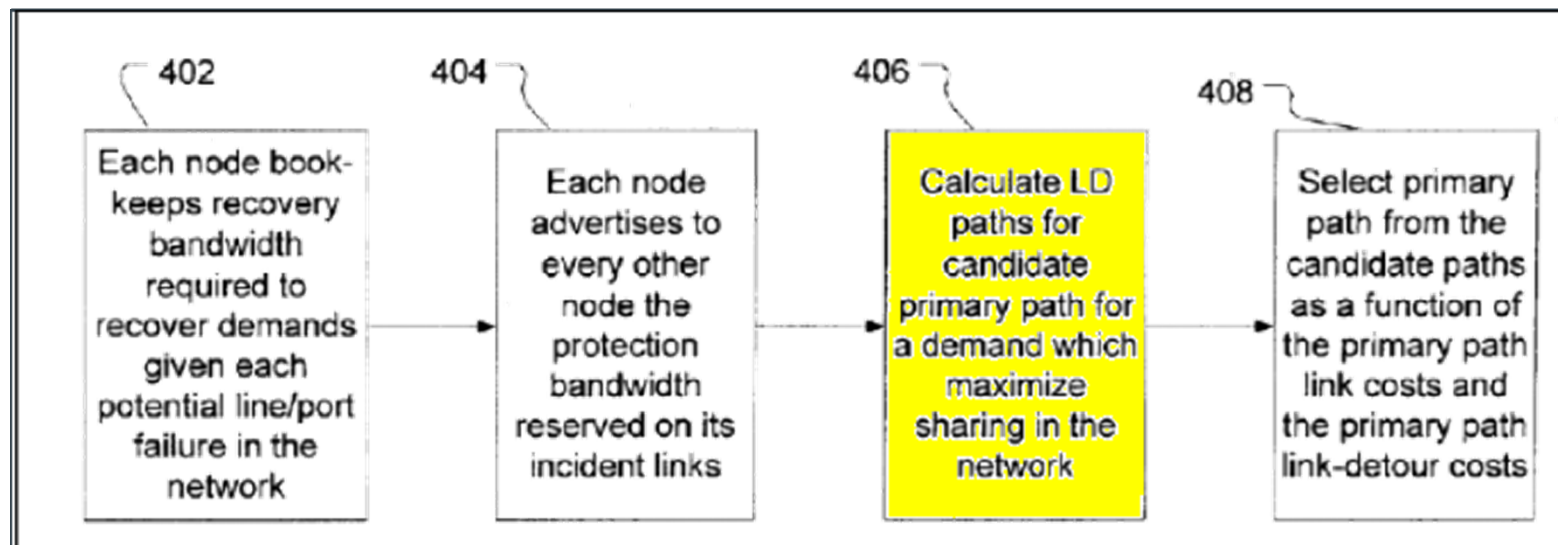
The '088 Patent draws an explicit distinction between bandwidth reservation and bandwidth allocation

Reserved Bandwidth ≠ Allocated Bandwidth

Embodiments of the present invention provide improved methods and systems for establishing a connection through a communication network, taking into account the ability to share bandwidth between the new connection and existing connections. A sharing definition defines connections that may share their bandwidth allocations. In order to establish the new connection, two or more candidate routes through the network are identified. For each of the candidate routes, the disclosed methods and systems calculate the additional bandwidth reservation, accumulated over the network segments along the candidate route in question, which would be allocated to the new connection if it were established through this route.

Petitioner's Cited References Do Not Teach Sharing Bandwidth Allocations

The “link detour” path in Dziong is merely *calculated* but not established, thus, no bandwidth is allocated to the link detour path



Petitioner's Cited References Do Not Teach Sharing Bandwidth Allocations

Sathyanath explicitly states that allocated bandwidth is not shared

but is, instead, only reserved. If the bandwidth were allocated in advance of a failure, this would correspond, in the parlance of the field of protection and restoration for optical transport networks, to a 1:1 protection scheme. If the bandwidth were not only allocated, but additionally if a copy of the service path's data were to be duplicated to the protection path, this would correspond to a 1+1 protection scheme. However, in preferred embodiments of this invention, the protection bandwidth is not allocated until after the detection of a failure. Thus, in such implementations, this unallocated bandwidth might be used for "opportunistic" data, e.g., data that has a lower guaranteed quality of service (QoS) than the protected traffic. Further, because the protection bandwidth is only reserved and not allocated, "sharing" can be supported, as defined below.

Roadmap

Ground 1

Independent claims 1, 8, 15 & 17 (Dependent claims 2-4, 6, 9-11, 13, 16, 18-20)

*Dziong +
Sathyanath*

- Cited references operate in a fundamentally different way from the invention disclosed in the '088 Patent
- Cited art fails to teach limitations relating to “allocating” bandwidth to the new connection. ([1.2]-[1.3], [8.4]-[8.5], [15.6]-[15.7], [17.3]-[17.4])

Ground 2

Dependent claims 7 & 14

*Dziong +
Sathyanath +
Jensen*

- Cited references operate in a fundamentally different way from the invention disclosed in the '088 Patent
- Cited art fails to teach limitations relating to “allocating” bandwidth to the new connection. ([1.2]-[1.3], [8.4]-[8.5], [15.6]-[15.7], [17.3]-[17.4])