

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

INVALIDITY CLAIM CHART Invalidity of U.S. Patent No. 9,900,249 in view of Shimizu

U.S. Patent Application No. 2006/0227779 A1 (“Shimizu”) was filed on April 4, 2006, and was published in 2006. Shimizu therefore qualifies as prior art to the '249 patent under, at least, (pre-AIA) 35 U.S.C. § 102(a) and/or (b). Shimizu anticipates and/or renders obvious (in combination with the knowledge of a person of ordinary skill in the art) the Asserted Claims of the '249 patent, at least as Dell understands Cloud Byte's application of the Asserted Claims in an effort to show infringement.

To the extent Cloud Byte argues that any element below is not disclosed by Shimizu, a person of ordinary skill in the art would have found it obvious to combine the teachings of Shimizu with the background knowledge of a person of ordinary skill in the art and/or the additional references, and exemplary teachings, set forth in Dell's Invalidity Contentions and accompanying charts and/or in Appendix F.

The chart below provides representative examples of where each element of each claim is found within Shimizu. Citations are meant to be exemplary, not exhaustive, and Dell reserves the right to identify and discuss additional portions of the reference in support of its contentions and/or to rebut arguments made by Cloud Byte. Citations to figures, drawings, tables, and the like include reference to any accompanying or related text. All internal cross references are meant to incorporate the cross-referenced material as if fully set forth therein. Where Dell states that Shimizu “discloses” a limitation, that disclosure may be express, implicit, and/or inherent.

It is Dell's position that Cloud Byte's Infringement Contentions have not established that any accused product or service infringes any valid claim. Thus, Dell's statements below should not be treated as an admission, implication, or suggestion that Dell agrees with Cloud Byte regarding either the scope, construction, or interpretation of any of the Asserted Claims or the infringement theories advanced by Cloud Byte in its Infringement Contentions, including whether any Asserted Claim satisfies 35 U.S.C. §§ 101 or 112. Nothing in this chart is intended to suggest that Dell agrees with Cloud Byte's application of any claim element, suggest a proposed construction at this stage of the case, or suggest that construction is needed, as the parties are not required to exchange terms for construction or propose claim constructions until a later date.

Cloud Byte has yet to identify any limitation of the Asserted Claims that it contends is not anticipated and/or rendered obvious by Shimizu. Dell therefore expressly reserves the right to respond to any such contention, including by identifying additional obviousness combinations, if Cloud Byte makes any such contention. This chart is subject to all reservations, objections, and disclaimers in Dell's Invalidity Contentions and any amendment, supplement, or modification thereof, which are incorporated herein by reference in their entirety.

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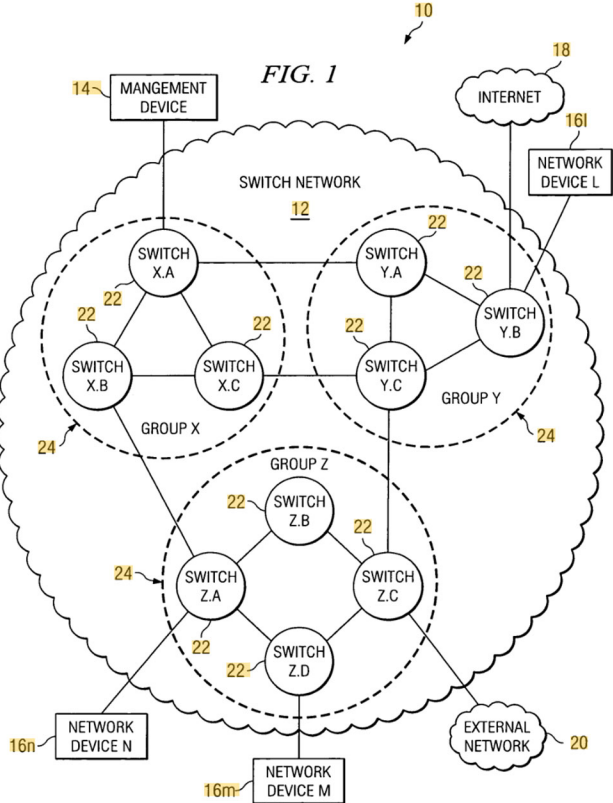
Asserted Claims	Shimizu
[1.pre] 1. A packet forwarding node, comprising:	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, a packet forwarding node. <i>See, e.g.:</i> Shimizu at Fig. 1:  FIG. 1 The diagram illustrates a network architecture. A central cloud-like shape represents the SWITCH NETWORK 12. Inside this network, there are three distinct groups: GROUP X, GROUP Y, and GROUP Z. GROUP X contains three switches labeled SWITCH X.A, SWITCH X.B, and SWITCH X.C. GROUP Y contains two switches labeled SWITCH Y.A and SWITCH Y.B. GROUP Z contains four switches labeled SWITCH Z.A, SWITCH Z.B, SWITCH Z.C, and SWITCH Z.D. Each switch is represented by a circle with a dashed border and is labeled with a reference numeral 22. A MANAGEMENT DEVICE 14, shown as a rectangle, is connected to the SWITCH NETWORK 12. Several network devices, represented by rectangles and labeled 16n, 16m, and 16l, are connected to the SWITCH NETWORK 12. The SWITCH NETWORK 12 is also connected to an INTERNET 18 (represented by a cloud) and an EXTERNAL NETWORK 20 (represented by a cloud). The entire system is labeled with the reference numeral 10.

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	Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a

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	group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0009]: FIG. 1 illustrates a system that uses a network based routing scheme to control the path of frames through a switch network; Shimizu at [0014]: FIG. 1 illustrates a system, indicated generally at 10, that uses a network based routing scheme to control the path of frames through a switch network. As illustrated, system 10 includes a switch network 12, a management device 14, network devices 16, an internet 18, and an external network 20. The elements of system 10 may interconnect using any suitable techniques or protocols. In general, elements within system 10 interoperate to control the path frames take through switch network 12. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized

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Asserted Claims	Shimizu
	into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0016]: Switches 22 represent networking devices that route frames within networks and/or between different networks. According to particular embodiments, each switch 22 represents a network device with multiple ports capable of switching network traffic among the ports. For example, switches 22 may each represent a chip-based switching device capable of switching frames among multiple ports based on standard Ethernet protocols. However, as used and described herein, switches 22 may include switches, routers, or any appropriate network devices capable of interconnecting network elements. Also, switches 22 may communicate using any suitable techniques or protocols for communication within switch network 12. In addition, as will be discussed in greater detail below, switches 22 implement a network based routing scheme to permit source routing of frames through switch network 12. Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12.

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Asserted Claims	Shimizu
	Shimizu at [0023]: In some embodiments, outbound tags are vector based. For vector based outbound tags, each outbound tag may specify a set of output ports. A sequence of these outbound tags in the frame can specify the path(s) of the frame, link by link through switch network 12. Each receiving switch 22 simply identifies the port(s) specified by the current outbound tag, removes the current outbound tag from the frame, and then forwards the frame on the specified port(s). For example, in the illustrated embodiment, switch X.A may receive a frame with vector based outbound tags. The first tag identifies port 4. In order to transmit the frame to the appropriate next switch 22, switch X.A removes the first tag and sends the frame on port 4. This frame would then be received by switch Y.A, and switch Y.A repeats a similar process in order to transmit the frame to the appropriate next switch 22. In one embodiment, each vector based tag is a bit map corresponding to the ports of switch 22. In another embodiment, vector based tags may reference memory locations, such as VLAN table entries, that indicate one or more outbound ports. Shimizu at [0025]: While switch network 12 is depicted as a plurality of switches 22 organized into established groups 24, it should be noted that this is a logical depiction. The components of switch network 12 may be located at one or more physical locations and/or may include additional or fewer components. Also, the functionality of switches 22 and groups 24 may be provided by any suitable collection and arrangement of components. The functions performed by the various components of switch network 12 may be accomplished by any suitable devices to control the path of frames through a network. Shimizu at [0029]:

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Asserted Claims	Shimizu
	Network devices 16 represent any device connectable to switch network 12. For example, network devices 16 may include personal computers, servers, file storage, network printers, and other network enabled devices. Network devices 16 communicate with other network devices 16, management device 14, internet 18, and external network 20 through switch network 12. Although not illustrated, network devices 16 can also be connected to other networks or other devices, components, or elements. As illustrated, system 10 includes three network devices: 16 l, 16 m, and 16 n. Network device 16l connects to switch network 12 through switch Y.B; network device 16 m connects to switch network 12 through switch Z.D; and network device 16 n connects to switch network 12 through switch Z.A. While system 10 includes three network devices 16, it is understood that any number and type of network devices 16 may be connected to switch network 12. Shimizu at [0032]: Particular embodiments of system using a network based routing scheme have been described and are not intended to be all-inclusive. While system 10 is depicted as containing a certain configuration and arrangement of elements, it should be noted that this is a logical depiction, and the components and functionality of system 10 may be combined, separated and distributed as appropriate both logically and physically. Also, the functionality of system 10 may be provided by any suitable collection and arrangement of components. The described and illustrated organization, number, and structure of switches 22 in switch network 12 is merely illustrative. Switches 22 may be organized and structured in any suitable manner and may include any suitable number or type of devices, and switch network 12 may include any appropriate configuration and number of groups 24. System 10 may be structured in any suitable manner to control the path of frames through switch network 12.
[1.a] a storage unit including a non-transitory computer readable medium configured to store a	Shimizu discloses, expressly and/or inherently, a storage unit including a non-transitory computer readable medium configured to store a packet forwarding table used for forwarding

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packet forwarding table used for forwarding a packet based on an identifier which identifies a link between nodes on a packet forwarding path; and	a packet based on an identifier which identifies a link between nodes on a packet forwarding path. <i>See, e.g.:</i> Shimizu at Figs. 2A, 2B, 2C:

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	FIG. 2A 34 NETWORK ROUTING TABLE IN SWITCH Z.A <table><tr><th>SWITCH/DEVICE</th><th>OUTBOUND PORT</th></tr><tr><td>B</td><td>1</td></tr><tr><td>C</td><td>2</td></tr><tr><td>D</td><td>2</td></tr><tr><td>N</td><td>4</td></tr><tr><td>P</td><td>5</td></tr><tr><td>Q</td><td>3</td></tr><tr><td>MANAGEMENT DEVICE</td><td>0</td></tr></table> FIG. 2B 40 GROUP ROUTING IN SWITCH Z.A <table><tr><th>GROUP</th><th>OUTBOUND PORT</th></tr><tr><td>X</td><td>0</td></tr><tr><td>Y</td><td>1</td></tr></table> FIG. 2C	SWITCH/DEVICE	OUTBOUND PORT	B	1	C	2	D	2	N	4	P	5	Q	3	MANAGEMENT DEVICE	0	GROUP	OUTBOUND PORT	X	0	Y	1
SWITCH/DEVICE	OUTBOUND PORT																						
B	1																						
C	2																						
D	2																						
N	4																						
P	5																						
Q	3																						
MANAGEMENT DEVICE	0																						
GROUP	OUTBOUND PORT																						
X	0																						
Y	1																						

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Asserted Claims	Shimizu
	Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]:

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	Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take through a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0010]: FIGS. 2A-C illustrate a group of switches from the switch network that employ a network based routing scheme and tables storing routing information maintained by one of the switches; Shimizu at [0019]: Additionally, routing information within a particular group 24 may be defined for that particular group 24 only. In some embodiments, network routing information is stored in network routing tables. The network routing table for each constituent switch 22 in a particular group 24 may only provide routing information for other switches 22 in that particular group 24. In certain embodiments, network routing tables maintain routing

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	information based on switch/port identifiers. This enables smaller table sizes and simpler look-up mechanisms, since switches 22 in one group 24 need not maintain routing information for switches 22 in other groups 24. Each switch 22 may further maintain basic routing information for other groups 24 in switch network 12. For example, each switch 22 in group X may maintain one routing table entry specifying a particular port for frames addressed for group Y. In particular embodiments, this enables appropriate routing without requiring lengthy routing tables While routing information is described as being stored in a tabular form, it is to be understood that routing information may be stored in any appropriate manner, including databases, files, hashes, etc. One embodiment of selected routing information stored by switches 22 is further explained below with reference to FIGS. 2A-C. Also, while not explicitly illustrated or described in detail, switches 22 may also maintain other routing information, such as Ethernet routing tables. Thus switches 22 may use a network based routing scheme for selected network traffic while using another routing scheme for other network traffic. Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0035]:

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Asserted Claims	Shimizu
	FIG. 2B illustrates one example of how routing information can be stored by switches 22. In the illustrated embodiment, switch Z.A stores routing information as a network routing table 34. Network routing table 34 includes a switch column 36 indicating a switch or device that should receive a frame, and an outbound port column 38 showing the corresponding outbound port on which a frame should be sent. When switch Z.A receives a frame destined for an identified switch 22 or device, such as network devices 16 m,n or management device 14, it references table 34 to determine on which port the frame should be sent. Shimizu at [0036]: In particular embodiments, the division of switch network 12 into groups 24 of switches 22 allows any specific port in switch network 12 to be uniquely referenced by use of a group/switch/port identifier. Additionally, within a group 24, a particular port may be uniquely referenced merely by the use of a switch/port identifier. Accordingly, within a particular group 24, such as group Z, network routing tables may be defined only for the group. As illustrated, network routing table 34 for switch Z.A only provides routing information for other switches 22 in group Z, devices connected to switch Z.A, and management device 14. As switch Z.A need not maintain routing information for switches 22 in groups 24 other than group Z, switch Z.A may have a smaller network routing table size and simpler look-up mechanisms. In certain embodiments, routing information is stored in tabular form, while in other embodiments, routing information is stored and/or maintained in a variety of different ways. Routing information is illustrated and described as being stored in table 34, but it is to be understood that this is merely for illustrative purposes and routing information may be stored in any suitable manner. Moreover, while not expressly illustrated, switches 22 may further include routing information to facilitate routing of frames using other protocols. For example, switches 22 may maintain Ethernet-based routing information for routing frames based on addressing information, that may include source and destination addresses for a frame.

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Asserted Claims	Shimizu
	Shimizu at [0037]: For example, switch Z.A may receive a frame with port ID based outbound tags. Switch Z.A looks at the first tag and determines whether the tag's group identification is equal to group Z. If so, switch Z.A determines whether the tag's switch identification is equal to switch Z.A. If the tag's switch identification is the same as the switch identification for switch Z.A, then switch Z.A strips the first tag from the frame and forwards the frame on the port identified by the tag. Otherwise, switch Z.A knows that the switch identified by the tag's switch identification should receive this frame. By reference to network routing table 34, switch Z.A can determine the appropriate outbound port for the frame so that it reaches the switch identified by the tag. Shimizu at [0039]: FIG. 2C illustrates an example of group routing information that may be stored and maintained by switch Z.A. As illustrated, switch network 12 includes group Z, group Y, and group X. In many embodiments, switch Z.A does not maintain routing information for switches 22 located in group Y or group X. Accordingly, in particular embodiments, switch Z.A maintains a table 40 providing routing information for group Y, as a whole, and group X, as a whole. The basic routing information for each group 24, listed by column 42, is correlated to an outbound port, listed by column 44. Thus, switch Z.A may maintain table 40 to specify a particular outbound port for frames addressed for group X: port 0 in the illustrated embodiment. In particular embodiments, the basic routing information for other groups 24 is stored in a variety of different formats, and the use of table 40 is intended to be illustrative and not limiting. While illustrated as having only two groups 24 stored, table 40 may include routing information corresponding to any number of different groups 24, devices, networks, etc. In some embodiments, switches 22 do not store group routing information.

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	Shimizu at [0040]: Group Z and tables 34 and 40, which are illustrated and described with respect to FIGS. 2A-C, are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While routing information is depicted in a tabular form, certain embodiments include routing information stored in any suitable manner. Additionally, while group Z is depicted as having a particular configuration and arrangement of components, it is intended that groups 24 include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network Shimizu at [0042]: As illustrated, path 50 includes five different hops (1-5). First, management device 14 sends the frame to switch X.A through hop 1. Then, switch X.A sends the frame to switch X.C in hop 2; switch X.C sends the frame to switch Y.C in hop 3; and switch Y.C sends the frame to switch Z.C in hop 4. Finally, switch Z.C sends the frame to external network 20 in hop 5. In some embodiments, the frame is structured to include vector based tags. The structure of a frame with vector based tags is shown in FIG. 3B for each hop (1-5) of path 50. In particular embodiments, the frame is structured to include port ID based tags. The structure of a frame with port ID based tags is shown in FIG. 3C for each hop (1-5) of path 50. Shimizu at [0043]: FIG. 3B shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a vector based tag indicating the next switch 22 in path 50. As illustrated, a frame includes a destination address 52, a

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	source address 54, one or more (or no) tags 56, and a payload 58. Destination address 52 may be a representation in any appropriate format or protocol of the destination of the frame. Source address 54, similarly, may be a representation in any appropriate format or protocol of the source of the frame. Tags 56 operate control the path of frames through switch network 12. Payload 58 represents any type of information and may include all information not contained in the header of the frame. In some embodiments, payload 58 is simply the information to be transmitted by the frame. In other embodiments, payload 58 represents any information not processed or analyzed by switches 22. Shimizu at [0056]: FIG. 5 is a flowchart illustrating a method 100 of processing a frame received at switch 22. In the illustrated embodiment, port ID based tags are used to control the path of frames through switch network 12. Switch 22 receives a frame at step 102. Then, in step 104, switch 22 determines whether or not the frame is in the format of the special routing protocol. In some embodiments, a virtual local area network identification tag at the beginning of the frame contains a particular value indicating that the special routing protocol can be used. In other embodiments, switch 22 determines that the frame uses or conforms to the special routing protocol in a variety of different ways. If the special routing protocol should not be applied to the frame, switch 22 processes the frame according to standard routing in step 106, and then method 100 is complete. In some embodiments, standard routing includes ethernet and/or internet protocol (IP) based routing, although switches 22 can use any appropriate routing protocols. Shimizu at [0058]: If switch 22 determined that the tag's group identification is equal to the group identification of switch 22, method 100 proceeds to step 118. In step 118, switch 22 determines whether the tag's switch identification is equal to the switch identification of switch 22. If so, switch 22

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	determines that the appropriate output port for the frame is equal to the port identification in the tag at step 120. Switch 22 removes the first tag from the frame in step 122 and sends the frame on the determined output port in step 124; then, method 100 ends. If the tag's switch identification is not equal to the switch identification of switch 22, method 100 proceeds from step 118 to step 126. In step 126, switch 22 accesses routing information stored by switch 22. In some embodiments, switch 22 stores routing information in a tabular form. Switch 22 determines, from the routing information, on which port the frame should be forwarded so that the frame is received by the particular switch 22 identified by the switch identification in the frame, step 128. Switch 22 sends the frame on that output port, step 130, and method 100 ends.
[1.b] at least one processor configured to execute program instructions to provide a forwarding unit configured to:	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute program instructions to provide a forwarding unit. <i>See, e.g.:</i> Shimizu at Fig. 1:

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Asserted Claims	Shimizu
	FIG. 1 The diagram illustrates a network architecture labeled FIG. 1. A central cloud-shaped boundary encloses a SWITCH NETWORK 12. This network is divided into three distinct groups, each enclosed by a dashed line: GROUP X, GROUP Y, and GROUP Z. GROUP X contains three switches: SWITCH X.A, SWITCH X.B, and SWITCH X.C. GROUP Y contains three switches: SWITCH Y.A, SWITCH Y.B, and SWITCH Y.C. GROUP Z contains four switches: SWITCH Z.A, SWITCH Z.B, SWITCH Z.C, and SWITCH Z.D. Each switch is represented by a circle with the number 22 next to it. External components and connections include: - A MANGEMENT DEVICE 14 connected to SWITCH X.A. - An INTERNET 18 cloud connected to SWITCH Y.A and NETWORK DEVICE L 16l. - An EXTERNAL NETWORK 20 cloud connected to SWITCH Z.C. - NETWORK DEVICE N 16n connected to SWITCH Z.A. - NETWORK DEVICE M 16m connected to SWITCH Z.D. - Arrows labeled 24 point to the dashed boundaries of GROUP X, GROUP Y, and GROUP Z. - The entire switch network is labeled 10 at the top right.

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	Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]:

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	Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take through a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0014]: FIG. 1 illustrates a system, indicated generally at 10, that uses a network based routing scheme to control the path of frames through a switch network. As illustrated, system 10 includes a switch network 12, a management device 14, network devices 16, an internet 18, and an external network 20. The elements of system 10 may interconnect using any suitable techniques or protocols. In general, elements within system 10 interoperate to control the path frames take through switch network 12. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications

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	between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0016]: Switches 22 represent networking devices that route frames within networks and/or between different networks. According to particular embodiments, each switch 22 represents a network device with multiple ports capable of switching network traffic among the ports. For example, switches 22 may each represent a chip-based switching device capable of switching frames among multiple ports based on standard Ethernet protocols. However, as used and described herein, switches 22 may include switches, routers, or any appropriate network devices capable of interconnecting network elements. Also, switches 22 may communicate using any suitable techniques or protocols for communication within switch network 12. In addition, as will be discussed in greater detail below, switches 22 implement a network based routing scheme to permit source routing of frames through switch network 12. Shimizu at [0025]: While switch network 12 is depicted as a plurality of switches 22 organized into established groups 24, it should be noted that this is a logical depiction. The components of switch network 12 may be located at one or more physical locations and/or may include additional or fewer components. Also, the functionality of switches 22 and groups 24 may be provided by any suitable collection and arrangement of components. The functions performed by the various components of switch network 12 may be accomplished by any suitable devices to control the path of frames through a network. Shimizu at [0032]:

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Asserted Claims	Shimizu
	Particular embodiments of system using a network based routing scheme have been described and are not intended to be all-inclusive. While system 10 is depicted as containing a certain configuration and arrangement of elements, it should be noted that this is a logical depiction, and the components and functionality of system 10 may be combined, separated and distributed as appropriate both logically and physically. Also, the functionality of system 10 may be provided by any suitable collection and arrangement of components. The described and illustrated organization, number, and structure of switches 22 in switch network 12 is merely illustrative. Switches 22 may be organized and structured in any suitable manner and may include any suitable number or type of devices, and switch network 12 may include any appropriate configuration and number of groups 24. System 10 may be structured in any suitable manner to control the path of frames through switch network 12.
[1.c] receive an incoming packet including a plurality of the identifiers;	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to receive an incoming packet including a plurality of the identifiers. <i>See, e.g.:</i> Shimizu at Figs. 3B, 3C:

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Asserted Claims	Shimizu
	FIG. 3B FIG. 3C Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port

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Asserted Claims	Shimizu
	identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port.

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Asserted Claims	Shimizu
	Shimizu at [0011]: FIGS. 3A-C illustrate a path of an outbound frame and the corresponding structure of the frame as it passes through various switches in the switch network; Shimizu at [0018]: In some embodiments, each group 24 is assigned a unique identifier within switch network 12. In the illustrated embodiment, each group 24 has a unique identifier: X, Y, or Z. In particular embodiments, each switch 22 in a particular group 24 is assigned a unique identifier within the particular group 24. The identifier for a particular switch 22 in one group 24 may be shared by a different switch 22 in a different group 24. For example, switch X.A and switch Y.A share a common switch identifier, A, but are individually identifiable because they have a different group identifier, X and Y. Additionally, each switch 22 may have multiple ports. Accordingly, within switch network 12, a specific port may be uniquely referenced by use of a group/switch/port identifier. For example, X.A.5 uniquely refers to port 5 on switch A in group X. Additionally, within a particular group 24, a particular port may be uniquely referenced merely by use of a switch/port identifier. For example, within group X, A.5 may uniquely refer to port 5 on switch X.A. Shimizu at [0019]: Additionally, routing information within a particular group 24 may be defined for that particular group 24 only. In some embodiments, network routing information is stored in network routing tables. The network routing table for each constituent switch 22 in a particular group 24 may only provide routing information for other switches 22 in that particular group 24. In certain embodiments, network routing tables maintain routing information based on switch/port identifiers. This enables smaller table sizes and simpler look-up mechanisms, since switches 22 in one group 24 need not maintain routing information for switches 22 in other groups 24. Each switch 22 may further maintain basic

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Asserted Claims	Shimizu
	routing information for other groups 24 in switch network 12. For example, each switch 22 in group X may maintain one routing table entry specifying a particular port for frames addressed for group Y. In particular embodiments, this enables appropriate routing without requiring lengthy routing tables While routing information is described as being stored in a tabular form, it is to be understood that routing information may be stored in any appropriate manner, including databases, files, hashes, etc. One embodiment of selected routing information stored by switches 22 is further explained below with reference to FIGS. 2A-C. Also, while not explicitly illustrated or described in detail, switches 22 may also maintain other routing information, such as Ethernet routing tables. Thus switches 22 may use a network based routing scheme for selected network traffic while using another routing scheme for other network traffic. Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0021]: For example, in the illustrated embodiment, a frame destined for management device 14 may be received by switch Z.C from external network 20. Switch Z.C may add an inbound tag before forwarding the frame on the port indicated by routing information maintained by switch Z.C, possibly forwarding the frame to switch Y.C. Switch Y.C may forward the frame

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Asserted Claims	Shimizu
	on the port indicated by its routing information and so on until the frame reaches its destination, management device 14. In other embodiments, each switch 22 receiving an inbound frame adds an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, a receiving switch 22 adds an inbound tag that simply indicates the port on which the receiving switch 22 received the frame, and each subsequent switch 22 that receives the frame may add another inbound tag that indicates the port on which that switch 22 received the frame. In some embodiments, the path a frame has taken through switch network 12 can be known by an examination of the inbound tags in the frame and, in some cases, knowledge of the structure of the switch network 12. Shimizu at [0022]: Outbound tags may be used to determine the particular path a frame should take through switch network 12. For example, management device 14 and network devices 16 can transmit frames with outbound tags in order to define a desired frame path. In some embodiments, any device aware of the outbound tag protocols used by switch network 12 and its constituent switches 22 can transmit a frame with outbound tags. In order to use outbound tags, a transmitting device may add one or more tags to the header of the frame. Each outbound tag may enable switch network 12 to transport the frame along a set portion of switch network 12, such as over a link between two switches 22 or across one group 24. Shimizu at [0023]: In some embodiments, outbound tags are vector based. For vector based outbound tags, each outbound tag may specify a set of output ports. A sequence of these outbound tags in the frame can specify the path(s) of the frame, link by link through switch network 12. Each receiving switch 22 simply identifies the port(s) specified by the current outbound tag, removes the current outbound tag from the frame, and then forwards the frame on the specified port(s). For example, in the illustrated embodiment, switch X.A may receive a frame with vector based outbound tags. The first tag identifies port 4. In order to transmit the

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Asserted Claims	Shimizu
	frame to the appropriate next switch 22, switch X.A removes the first tag and sends the frame on port 4. This frame would then be received by switch Y.A, and switch Y.A repeats a similar process in order to transmit the frame to the appropriate next switch 22. In one embodiment, each vector based tag is a bit map corresponding to the ports of switch 22. In another embodiment, vector based tags may reference memory locations, such as VLAN table entries, that indicate one or more outbound ports. Shimizu at [0024]: In other embodiments, outbound tags are port identification (port ID) based. For port ID based outbound tags, each outbound tag may specify a group/switch/port. A sequence of these outbound tags in the frame specifies the hop from one group 24 either to the next group 24, to an external network (such as internet 18 or external network 20), or to a device (such as management device 14 or network devices 16). With port ID based outbound tags, the “current” outbound tag may persist as the frame passes through a particular group 24 and may be removed when the frame is forwarded outside the particular group 24. For example, in the illustrated embodiment, switch Y.B may receive a frame ultimately destined for network device 16 m, which is connected to switch Z.D. If the frame has port ID based outbound tags, switch Y.B determines the group/switch/port designated by the first tag in the frame. For this example, it may be port Y.C.2. Consider, for example, switch Y.B receiving a frame with an initial tag indicating port Y.C.2. Switch Y.B first evaluates whether the group identification specified by the tag matches the group in which switch Y.B is a member. If so, switch Y.B looks to the switch identification specified by the first tag to determine if the tag identifies switch Y.B (which in this instance, it does not). Because the switch identification specifies another switch in group Y, switch B accesses its routing information to determine the appropriate port on which to send a frame to switch Y.C. Then, switch Y.B forwards the frame on that port with the first tag still part of the frame. Upon receipt of this frame, switch Y.C checks the group identification and switch identification indicated by the tag. In this instance, since the group and switch identification in the tag specify switch Y.C, switch Y.C may remove the first tag from the frame and forward the frame on the port designated by the tag—port 2 in this example.

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Asserted Claims	Shimizu
	Shimizu at [0027]: In some embodiments, management device 14 receives network management messages from network devices 16, internet 18, external network 20, and/or switches 22. To control routing of management messages to management device 14, switches 22 within switch network 12 may provide for special handling of received management messages. For example, when a particular switch 22 detects a received network management message, switch 22 may access its routing information to determine a port on which to forward the network management message. In particular embodiments, each switch 22 has an defined port on which network management messages should be sent. The defined port may vary from switch 22 to switch 22. However, a network management message received by switch Z.C, for example, may always travel through the same switches 22 along the same path to reach management device 14. In certain embodiments, one or more of switches 22 add inbound tags to network management messages so that management device 14 knows the port the network management message entered switch network 12 and/or the precise route that each network management message took to reach the management device 14. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20.

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Asserted Claims	Shimizu
	Shimizu at [0036]: In particular embodiments, the division of switch network 12 into groups 24 of switches 22 allows any specific port in switch network 12 to be uniquely referenced by use of a group/switch/port identifier. Additionally, within a group 24, a particular port may be uniquely referenced merely by the use of a switch/port identifier. Accordingly, within a particular group 24, such as group Z, network routing tables may be defined only for the group. As illustrated, network routing table 34 for switch Z.A only provides routing information for other switches 22 in group Z, devices connected to switch Z.A, and management device 14. As switch Z.A need not maintain routing information for switches 22 in groups 24 other than group Z, switch Z.A may have a smaller network routing table size and simpler look-up mechanisms. In certain embodiments, routing information is stored in tabular form, while in other embodiments, routing information is stored and/or maintained in a variety of different ways. Routing information is illustrated and described as being stored in table 34, but it is to be understood that this is merely for illustrative purposes and routing information may be stored in any suitable manner. Moreover, while not expressly illustrated, switches 22 may further include routing information to facilitate routing of frames using other protocols. For example, switches 22 may maintain Ethernet-based routing information for routing frames based on addressing information, that may include source and destination addresses for a frame. Shimizu at [0037]: For example, switch Z.A may receive a frame with port ID based outbound tags. Switch Z.A looks at the first tag and determines whether the tag's group identification is equal to group Z. If so, switch Z.A determines whether the tag's switch identification is equal to switch Z.A. If the tag's switch identification is the same as the switch identification for switch Z.A, then switch Z.A strips the first tag from the frame and forwards the frame on the port identified by the tag. Otherwise, switch Z.A knows that the switch identified by the tag's switch

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Asserted Claims	Shimizu
	identification should receive this frame. By reference to network routing table 34, switch Z.A can determine the appropriate outbound port for the frame so that it reaches the switch identified by the tag. Shimizu at [0039]: FIG. 2C illustrates an example of group routing information that may be stored and maintained by switch Z.A. As illustrated, switch network 12 includes group Z, group Y, and group X. In many embodiments, switch Z.A does not maintain routing information for switches 22 located in group Y or group X. Accordingly, in particular embodiments, switch Z.A maintains a table 40 providing routing information for group Y, as a whole, and group X, as a whole. The basic routing information for each group 24, listed by column 42, is correlated to an outbound port, listed by column 44. Thus, switch Z.A may maintain table 40 to specify a particular outbound port for frames addressed for group X: port 0 in the illustrated embodiment. In particular embodiments, the basic routing information for other groups 24 is stored in a variety of different formats, and the use of table 40 is intended to be illustrative and not limiting. While illustrated as having only two groups 24 stored, table 40 may include routing information corresponding to any number of different groups 24, devices, networks, etc. In some embodiments, switches 22 do not store group routing information. Shimizu at [0040]: Group Z and tables 34 and 40, which are illustrated and described with respect to FIGS. 2A-C, are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While routing information is depicted in a tabular form, certain embodiments include routing information stored in any suitable manner. Additionally, while group Z is depicted as having a particular configuration and arrangement of components, it is intended that groups 24 include any

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Asserted Claims	Shimizu
	suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network Shimizu at [0043]: FIG. 3B shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a vector based tag indicating the next switch 22 in path 50. As illustrated, a frame includes a destination address 52, a source address 54, one or more (or no) tags 56, and a payload 58. Destination address 52 may be a representation in any appropriate format or protocol of the destination of the frame. Source address 54, similarly, may be a representation in any appropriate format or protocol of the source of the frame. Tags 56 operate control the path of frames through switch network 12. Payload 58 represents any type of information and may include all information not contained in the header of the frame. In some embodiments, payload 58 is simply the information to be transmitted by the frame. In other embodiments, payload 58 represents any information not processed or analyzed by switches 22. Shimizu at [0044]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, four tags 56, and payload 58. Switch X.A receives the frame and extracts tag 56 a. Because tag 56 a contains the value 5, switch X.A sends the frame on port 5 after removing tag 56 a from the frame. So, during hop 2, the frame contains destination address 52, source address 54, three tags 56, and payload 58. After hop 2, switch X.C receives the frame and extracts tag 56 b. As illustrated, tag 56 b contains the value 4. Switch X.C removes tag 56 b from the frame and sends the frame out port 4. During hop 3, the frame contains destination address 52, source address 54, two tags 56, and payload 58. Switch Y.C receives the frame and extracts tag 56 c. Tag 56 c contains the value 0, so switch Y.C sends the frame on port 0 after removing tag 56 c from the frame. For hop 4, the frame contains

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	destination address 52, source address 54, one tag 56, and payload 58. Switch Z.C receives the frame and extracts the last tag 56: tag 56 d. Tag 56 d contains the value 3. Switch Z.C removes tag 56 d from the frame and sends the frame out port 3, after which it is received by external network 20. Shimizu at [0045]: The frame structure in FIG. 3B depicts the logical information contained in a number of vector based tags merely for illustrative purposes. However, as discussed above, the vector based tags may include information encoded using any suitable format to permit switches 22 to appropriately identify one or more outbound ports. As noted above, each vector based tag may include a bit vector, a reference to a bit vector stored in memory, or any other data structure suitable to indicate one or more outbound ports. Shimizu at [0046]: FIG. 3C shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a port ID based tag indicating the next group 24 in path 50. As illustrated, a frame includes destination address 52, source address 54, one or more (or no) tags 60, and payload 58. In some embodiments, destination address 52, source address 54, and payload 58 are similar to those represented in FIG. 3B. Tags 60 operate control the path of frames through switch network 12. Shimizu at [0047]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.A receives the frame and extracts tag 60 a. Tag 60 a specifies port X.C.4: port 4 of switch X.C. Switch X.A first

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Asserted Claims	Shimizu
	compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.A then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is no match, switch X.A looks to its routing information to determine the appropriate outbound port for a frame destined for switch X.C. Switch X.A identifies port 5 as the correct port and sends the frame on port 5 towards switch X.C. In the illustrated embodiment, switch X.A does not remove tag 60 a from the frame because there was no match of the switch identification in tag 60 a and the switch identification of switch X.A. Shimizu at [0048]: During hop 2, the frame still contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.C receives the frame and extracts tag 60 a. Switch X.C first compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.C then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is a match, switch X.C evaluates the port identification, which is 4. Switch X.C first removes tag 60 a, and then sends the frame on port 4 towards switch Y.C. Shimizu at [0049]: For hop 3, the frame contains destination address 52, source address 54, two tags 60, and payload 58. Switch Y.C receives the frame and extracts tag 60 b. Switch Y.C, similarly, first compares the group identification of tag 60 a, “Y,” to its group identification. Finding there is a match, switch Y.C then compares the switch identification of tag 60 b, “C,” to its switch identification. Because there is a match, switch Y.C evaluates the port identification, which indicates port 0. Switch Y.C removes tag 60 b and sends the frame on port 0. Shimizu at [0050]:

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Asserted Claims	Shimizu
	Accordingly, the frame contains destination address 52, source address 54, one tag 60 c, and payload 58 during hop 4. Switch Z.C receives the frame and extracts tag 60 c. First, switch Z.C compares the group identification of tag 60 a, “Z,” to its group identification. Finding a match, switch Z.C compares the switch identification of tag 60 c, “C,” to its switch identification. Because there is another match, switch Y.C evaluates the port identification, port 3. Switch Z.C removes tag 60 c and sends the frame on port 3. The frame, during hop 5 contains destination address 52, source address 54, and payload 58. After hop 5, the frame is received by external network 20. Shimizu at [0051]: The devices and frame configurations illustrated and described with respect to FIGS. 3A-C are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While frames are depicted as incorporating a particular protocol and structure, the frames in certain embodiments are structured in any suitable manner and utilize any protocols. Specifically, while frames are shown with destination address 52, source address 54, and payload 58, certain embodiments contemplate any frame structure accompanying tags that control the path of frames through switch network 12. Additionally, while the path taken by a frame depicted as having a particular set of switches 22, it is intended that this path include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network Shimizu at [0052]: FIG. 4 is a flowchart illustrating a method 80 of processing a network management message received at one of switches 22. In the illustrated embodiment, port ID based tags are added to inbound network management messages so that management device 14 can determine the precise entry point of the network management messages that management device 14 receives.

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Asserted Claims	Shimizu
	Shimizu at [0053]: Switch 22 receives a frame at step 82. Switch 22 determines whether the frame is a network management message in step 84. Network management messages may be identified, for example, by information contained in the header of the frame, by the frame being received at a particular time, by the frame being received from a particular location, or in any other appropriate manner. If the frame is not a network management message, a method similar to that shown in FIG. 5 may be followed, shown as step 86. However, if the frame is a network management message, method 80 continues to step 88, where switch 22 accesses routing information stored on switch 22. Using the routing information, switch 22 determines the appropriate output port for the network management message in step 90. In some embodiments, switch 22 accesses the routing information, which identifies the appropriate output port for any and all network message. For example, the routing information may be similar to that illustrated and described with respect to FIG. 2B. In other embodiments, switch 22 uses the routing information to calculate the appropriate output port for the network management message. Shimizu at [0055]: The method described with respect to FIG. 4 is merely illustrative, and it is understood that the manner of operation and devices indicated as performing the operations may be modified in any appropriate manner. For example, in some embodiments, port ID based tags are added to inbound network management messages. While the method describes particular steps performed in a specific order, it should be understood that system 10 contemplates any suitable collection and arrangement of elements performing some, all, or none of these steps in any operable order. Shimizu at [0056]:

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Asserted Claims	Shimizu
	FIG. 5 is a flowchart illustrating a method 100 of processing a frame received at switch 22. In the illustrated embodiment, port ID based tags are used to control the path of frames through switch network 12. Switch 22 receives a frame at step 102. Then, in step 104, switch 22 determines whether or not the frame is in the format of the special routing protocol. In some embodiments, a virtual local area network identification tag at the beginning of the frame contains a particular value indicating that the special routing protocol can be used. In other embodiments, switch 22 determines that the frame uses or conforms to the special routing protocol in a variety of different ways. If the special routing protocol should not be applied to the frame, switch 22 processes the frame according to standard routing in step 106, and then method 100 is complete. In some embodiments, standard routing includes ethernet and/or internet protocol (IP) based routing, although switches 22 can use any appropriate routing protocols. Shimizu at [0058]: If switch 22 determined that the tag's group identification is equal to the group identification of switch 22, method 100 proceeds to step 118. In step 118, switch 22 determines whether the tag's switch identification is equal to the switch identification of switch 22. If so, switch 22 determines that the appropriate output port for the frame is equal to the port identification in the tag at step 120. Switch 22 removes the first tag from the frame in step 122 and sends the frame on the determined output port in step 124; then, method 100 ends. If the tag's switch identification is not equal to the switch identification of switch 22, method 100 proceeds from step 118 to step 126. In step 126, switch 22 accesses routing information stored by switch 22. In some embodiments, switch 22 stores routing information in a tabular form. Switch 22 determines, from the routing information, on which port the frame should be forwarded so that the frame is received by the particular switch 22 identified by the switch identification in the frame, step 128. Switch 22 sends the frame on that output port, step 130, and method 100 ends.

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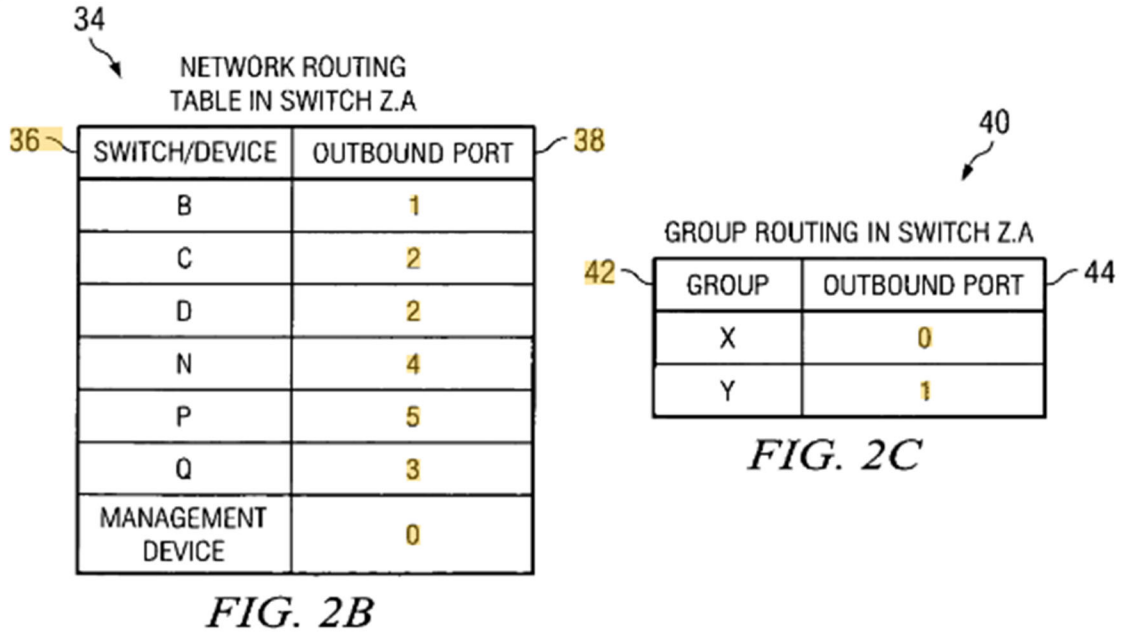
Asserted Claims	Shimizu
[1.d] determine a direction to forward the incoming packet;	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to determine a direction to forward the incoming packet. <i>See, e.g.:</i> Shimizu at Figs. 2B, 2C:  FIG. 2B FIG. 2C Shimizu at Figs. 3A, 3B, 3C

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	FIG. 3A Diagram illustrating a network topology (FIG. 3A). A Management Device (14) is connected to a sequence of switches (22) via hops (1-5). The switches are grouped into three groups (24): GROUP X (Switch X.A), GROUP Y (Switch Y.C), and GROUP Z (Switch Z.C). The sequence ends with an External Network (20). FIG. 3B Diagram illustrating the hop-by-hop frame structure (FIG. 3B). The frame structure is shown for hops 1 through 5, detailing the fields (52, 54, 56a, 56b, 56c, 56d, 58) and the payload (58). <table><tr><th>Hop</th><th>52</th><th>54</th><th>56a</th><th>56b</th><th>56c</th><th>56d</th><th>58</th></tr><tr><td>hop 1</td><td>DA</td><td>SA</td><td>5</td><td>4</td><td>0</td><td>3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>4</td><td>0</td><td>3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>0</td><td>3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>3</td><td></td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td></td><td>PAYLOAD</td></tr></table> FIG. 3C Diagram illustrating the hop-by-hop frame structure (FIG. 3C). The frame structure is shown for hops 1 through 5, detailing the fields (52, 54, 60a, 60b, 60c, 58) and the payload (58). <table><tr><th>Hop</th><th>52</th><th>54</th><th>60a</th><th>60b</th><th>60c</th><th>58</th></tr><tr><td>hop 1</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>Y.C.0</td><td>Z.C.3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>Z.C.3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td>PAYLOAD</td></tr></table> Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network.	Hop	52	54	56a	56b	56c	56d	58	hop 1	DA	SA	5	4	0	3	PAYLOAD	hop 2	DA	SA	4	0	3		PAYLOAD	hop 3	DA	SA	0	3			PAYLOAD	hop 4	DA	SA	3				PAYLOAD	hop 5	DA	SA					PAYLOAD	Hop	52	54	60a	60b	60c	58	hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD	hop 4	DA	SA	Z.C.3			PAYLOAD	hop 5	DA	SA				PAYLOAD
Hop	52	54	56a	56b	56c	56d	58																																																																																				
hop 1	DA	SA	5	4	0	3	PAYLOAD																																																																																				
hop 2	DA	SA	4	0	3		PAYLOAD																																																																																				
hop 3	DA	SA	0	3			PAYLOAD																																																																																				
hop 4	DA	SA	3				PAYLOAD																																																																																				
hop 5	DA	SA					PAYLOAD																																																																																				
Hop	52	54	60a	60b	60c	58																																																																																					
hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD																																																																																					
hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD																																																																																					
hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD																																																																																					
hop 4	DA	SA	Z.C.3			PAYLOAD																																																																																					
hop 5	DA	SA				PAYLOAD																																																																																					

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0011]: FIGS. 3A-C illustrate a path of an outbound frame and the corresponding structure of the frame as it passes through various switches in the switch network; Shimizu at [0014]: FIG. 1 illustrates a system, indicated generally at 10, that uses a network based routing scheme to control the path of frames through a switch network. As illustrated, system 10 includes a switch network 12, a management device 14, network devices 16, an internet 18, and an external network 20. The elements of system 10 may interconnect using any suitable techniques or protocols. In general, elements within system 10 interoperate to control the path frames take through switch network 12. Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0021]: For example, in the illustrated embodiment, a frame destined for management device 14 may be received by switch Z.C from external network 20. Switch Z.C may add an inbound tag before forwarding the frame on the port indicated by routing information maintained by switch Z.C, possibly forwarding the frame to switch Y.C. Switch Y.C may forward the frame on the port indicated by its routing information and so on until the frame reaches its destination, management device 14. In other embodiments, each switch 22 receiving an inbound frame adds an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, a receiving switch 22 adds an inbound tag that simply indicates the port on which the receiving switch 22 received the frame, and each subsequent switch 22 that receives the frame may add another inbound tag that indicates the port on which that switch 22 received the frame. In some embodiments, the path a frame has taken through switch network 12 can be known by an examination of the inbound tags in the frame and, in some cases, knowledge of the structure of the switch network 12. Shimizu at [0022]: Outbound tags may be used to determine the particular path a frame should take through switch network 12. For example, management device 14 and network devices 16 can transmit frames with outbound tags in order to define a desired frame path. In some embodiments, any device aware of the outbound tag protocols used by switch network 12 and its constituent switches 22 can transmit a frame with outbound tags. In order to use outbound tags, a transmitting device may add one or more tags to the header of the frame. Each outbound tag may enable switch network 12 to transport the frame along a set portion of switch network 12, such as over a link between two switches 22 or across one group 24.

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	Shimizu at [0023]: In some embodiments, outbound tags are vector based. For vector based outbound tags, each outbound tag may specify a set of output ports. A sequence of these outbound tags in the frame can specify the path(s) of the frame, link by link through switch network 12. Each receiving switch 22 simply identifies the port(s) specified by the current outbound tag, removes the current outbound tag from the frame, and then forwards the frame on the specified port(s). For example, in the illustrated embodiment, switch X.A may receive a frame with vector based outbound tags. The first tag identifies port 4. In order to transmit the frame to the appropriate next switch 22, switch X.A removes the first tag and sends the frame on port 4. This frame would then be received by switch Y.A, and switch Y.A repeats a similar process in order to transmit the frame to the appropriate next switch 22. In one embodiment, each vector based tag is a bit map corresponding to the ports of switch 22. In another embodiment, vector based tags may reference memory locations, such as VLAN table entries, that indicate one or more outbound ports. Shimizu at [0024]: In other embodiments, outbound tags are port identification (port ID) based. For port ID based outbound tags, each outbound tag may specify a group/switch/port. A sequence of these outbound tags in the frame specifies the hop from one group 24 either to the next group 24, to an external network (such as internet 18 or external network 20), or to a device (such as management device 14 or network devices 16). With port ID based outbound tags, the “current” outbound tag may persist as the frame passes through a particular group 24 and may be removed when the frame is forwarded outside the particular group 24. For example, in the illustrated embodiment, switch Y.B may receive a frame ultimately destined for network device 16 m, which is connected to switch Z.D. If the frame has port ID based outbound tags, switch Y.B determines the group/switch/port designated by the first tag in the frame. For this example, it may be port Y.C.2. Consider, for example, switch Y.B receiving a frame with an initial tag indicating port Y.C.2. Switch Y.B first evaluates whether the group

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Asserted Claims	Shimizu
	identification specified by the tag matches the group in which switch Y.B is a member. If so, switch Y.B looks to the switch identification specified by the first tag to determine if the tag identifies switch Y.B (which in this instance, it does not). Because the switch identification specifies another switch in group Y, switch B accesses its routing information to determine the appropriate port on which to send a frame to switch Y.C. Then, switch Y.B forwards the frame on that port with the first tag still part of the frame. Upon receipt of this frame, switch Y.C checks the group identification and switch identification indicated by the tag. In this instance, since the group and switch identification in the tag specify switch Y.C, switch Y.C may remove the first tag from the frame and forward the frame on the port designated by the tag—port 2 in this example. Shimizu at [0027]: In some embodiments, management device 14 receives network management messages from network devices 16, internet 18, external network 20, and/or switches 22. To control routing of management messages to management device 14, switches 22 within switch network 12 may provide for special handling of received management messages. For example, when a particular switch 22 detects a received network management message, switch 22 may access its routing information to determine a port on which to forward the network management message. In particular embodiments, each switch 22 has an defined port on which network management messages should be sent. The defined port may vary from switch 22 to switch 22. However, a network management message received by switch Z.C, for example, may always travel through the same switches 22 along the same path to reach management device 14. In certain embodiments, one or more of switches 22 add inbound tags to network management messages so that management device 14 knows the port the network management message entered switch network 12 and/or the precise route that each network management message took to reach the management device 14. Shimizu at [0040]:

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Asserted Claims	Shimizu
	Group Z and tables 34 and 40, which are illustrated and described with respect to FIGS. 2A-C, are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While routing information is depicted in a tabular form, certain embodiments include routing information stored in any suitable manner. Additionally, while group Z is depicted as having a particular configuration and arrangement of components, it is intended that groups 24 include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network Shimizu at [0041]: FIGS. 3A-C illustrate a path of an outbound frame and the corresponding structure of the frame as it passes through various switches 22. FIG. 3A illustrates the path 50 of a frame. In the illustrated embodiment, a frame is sent by management device 14 through four switches 22 that are constituents of three different groups 24 and arrives at external network 20. Management device 14 may structure a frame so that various switches 22 in switch network 12 know which particular direction to route the frame. Management device 14 may do this so that the most efficient route is taken, the route with the least traffic is used, a faulty switch 22 is avoided, or for any suitable reason. Management device 14 may send the frame as a response to a frame sent by external network 20. The route selected by management device 14 may be selected so that external network 20 receives the frame at the same port from which the original message was sent. Shimizu at [0043]: FIG. 3B shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a vector based tag indicating the next switch 22 in path 50. As illustrated, a frame includes a destination address 52, a source address 54, one or more (or no) tags 56, and a payload 58. Destination address 52 may be a representation in any appropriate format or protocol of the destination of the frame.

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Asserted Claims	Shimizu
	Source address 54, similarly, may be a representation in any appropriate format or protocol of the source of the frame. Tags 56 operate control the path of frames through switch network 12. Payload 58 represents any type of information and may include all information not contained in the header of the frame. In some embodiments, payload 58 is simply the information to be transmitted by the frame. In other embodiments, payload 58 represents any information not processed or analyzed by switches 22. Shimizu at [0047]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.A receives the frame and extracts tag 60 a. Tag 60 a specifies port X.C.4: port 4 of switch X.C. Switch X.A first compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.A then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is no match, switch X.A looks to its routing information to determine the appropriate outbound port for a frame destined for switch X.C. Switch X.A identifies port 5 as the correct port and sends the frame on port 5 towards switch X.C. In the illustrated embodiment, switch X.A does not remove tag 60 a from the frame because there was no match of the switch identification in tag 60 a and the switch identification of switch X.A. Shimizu at [0048]: During hop 2, the frame still contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.C receives the frame and extracts tag 60 a. Switch X.C first compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.C then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is a match, switch X.C evaluates the port identification, which is 4. Switch X.C first removes tag 60 a, and then sends the frame on port 4 towards switch Y.C.

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Asserted Claims	Shimizu
	Shimizu at [0049]: For hop 3, the frame contains destination address 52, source address 54, two tags 60, and payload 58. Switch Y.C receives the frame and extracts tag 60 b. Switch Y.C, similarly, first compares the group identification of tag 60 a, “Y,” to its group identification. Finding there is a match, switch Y.C then compares the switch identification of tag 60 b, “C,” to its switch identification. Because there is a match, switch Y.C evaluates the port identification, which indicates port 0. Switch Y.C removes tag 60 b and sends the frame on port 0. Shimizu at [0050]: Accordingly, the frame contains destination address 52, source address 54, one tag 60 c, and payload 58 during hop 4. Switch Z.C receives the frame and extracts tag 60 c. First, switch Z.C compares the group identification of tag 60 a, “Z,” to its group identification. Finding a match, switch Z.C compares the switch identification of tag 60 c, “C,” to its switch identification. Because there is another match, switch Y.C evaluates the port identification, port 3. Switch Z.C removes tag 60 c and sends the frame on port 3. The frame, during hop 5 contains destination address 52, source address 54, and payload 58. After hop 5, the frame is received by external network 20. Shimizu at [0051]: The devices and frame configurations illustrated and described with respect to FIGS. 3A-C are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While frames are depicted as incorporating a particular protocol and structure, the frames in certain embodiments are structured in any suitable manner and utilize any protocols. Specifically, while frames are shown with destination address 52, source address 54, and payload 58,

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Asserted Claims	Shimizu
	certain embodiments contemplate any frame structure accompanying tags that control the path of frames through switch network 12. Additionally, while the path taken by a frame depicted as having a particular set of switches 22, it is intended that this path include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network
[1.e] determine whether to forward to an external network;	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to determine whether to forward to an external network. <i>See, e.g.:</i> Shimizu at Figs. 3A, 3B, 3C

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Asserted Claims	Shimizu																																																																																										
	FIG. 3A <pre>graph LR MD[MANGEMENT DEVICE 14] -- hop 1 --> S1((SWITCH X.A 22)) S1 -- hop 2 --> S2((SWITCH X.C 22)) S2 -- hop 3 --> S3((SWITCH Y.C 22)) S3 -- hop 4 --> S4((SWITCH Z.C 22)) S4 -- hop 5 --> EN((EXTERNAL NETWORK 20)) subgraph GROUP_X [GROUP X] S1 end subgraph GROUP_Y [GROUP Y] S3 end subgraph GROUP_Z [GROUP Z] S4 end</pre> FIG. 3B <table><thead><tr><th></th><th>52</th><th>54</th><th>56a</th><th>56b</th><th>56c</th><th>56d</th><th>58</th></tr></thead><tbody><tr><td>hop 1</td><td>DA</td><td>SA</td><td>5</td><td>4</td><td>0</td><td>3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>4</td><td>0</td><td>3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>0</td><td>3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>3</td><td></td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td></td><td>PAYLOAD</td></tr></tbody></table> FIG. 3C <table><thead><tr><th></th><th>52</th><th>54</th><th>60a</th><th>60b</th><th>60c</th><th>58</th></tr></thead><tbody><tr><td>hop 1</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>Y.C.0</td><td>Z.C.3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>Z.C.3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td>PAYLOAD</td></tr></tbody></table> Shimizu at Figs. 2B, 2C:		52	54	56a	56b	56c	56d	58	hop 1	DA	SA	5	4	0	3	PAYLOAD	hop 2	DA	SA	4	0	3		PAYLOAD	hop 3	DA	SA	0	3			PAYLOAD	hop 4	DA	SA	3				PAYLOAD	hop 5	DA	SA					PAYLOAD		52	54	60a	60b	60c	58	hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD	hop 4	DA	SA	Z.C.3			PAYLOAD	hop 5	DA	SA				PAYLOAD
	52	54	56a	56b	56c	56d	58																																																																																				
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hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD																																																																																					
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hop 4	DA	SA	Z.C.3			PAYLOAD																																																																																					
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	34 NETWORK ROUTING TABLE IN SWITCH Z.A 36 <table><tr><th>SWITCH/DEVICE</th><th>OUTBOUND PORT</th></tr><tr><td>B</td><td>1</td></tr><tr><td>C</td><td>2</td></tr><tr><td>D</td><td>2</td></tr><tr><td>N</td><td>4</td></tr><tr><td>P</td><td>5</td></tr><tr><td>Q</td><td>3</td></tr><tr><td>MANAGEMENT DEVICE</td><td>0</td></tr></table> 38 FIG. 2B 40 GROUP ROUTING IN SWITCH Z.A 42 <table><tr><th>GROUP</th><th>OUTBOUND PORT</th></tr><tr><td>X</td><td>0</td></tr><tr><td>Y</td><td>1</td></tr></table> 44 FIG. 2C Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]:	SWITCH/DEVICE	OUTBOUND PORT	B	1	C	2	D	2	N	4	P	5	Q	3	MANAGEMENT DEVICE	0	GROUP	OUTBOUND PORT	X	0	Y	1
SWITCH/DEVICE	OUTBOUND PORT																						
B	1																						
C	2																						
D	2																						
N	4																						
P	5																						
Q	3																						
MANAGEMENT DEVICE	0																						
GROUP	OUTBOUND PORT																						
X	0																						
Y	1																						

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Asserted Claims	Shimizu
	According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0011]: FIGS. 3A-C illustrate a path of an outbound frame and the corresponding structure of the frame as it passes through various switches in the switch network; Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0021]: For example, in the illustrated embodiment, a frame destined for management device 14 may be received by switch Z.C from external network 20. Switch Z.C may add an inbound tag before forwarding the frame on the port indicated by routing information maintained by switch Z.C, possibly forwarding the frame to switch Y.C. Switch Y.C may forward the frame on the port indicated by its routing information and so on until the frame reaches its destination, management device 14. In other embodiments, each switch 22 receiving an inbound frame adds an inbound tag indicating the group/switch/port that received the frame.

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Asserted Claims	Shimizu
	In particular embodiments, a receiving switch 22 adds an inbound tag that simply indicates the port on which the receiving switch 22 received the frame, and each subsequent switch 22 that receives the frame may add another inbound tag that indicates the port on which that switch 22 received the frame. In some embodiments, the path a frame has taken through switch network 12 can be known by an examination of the inbound tags in the frame and, in some cases, knowledge of the structure of the switch network 12. Shimizu at [0022]: Outbound tags may be used to determine the particular path a frame should take through switch network 12. For example, management device 14 and network devices 16 can transmit frames with outbound tags in order to define a desired frame path. In some embodiments, any device aware of the outbound tag protocols used by switch network 12 and its constituent switches 22 can transmit a frame with outbound tags. In order to use outbound tags, a transmitting device may add one or more tags to the header of the frame. Each outbound tag may enable switch network 12 to transport the frame along a set portion of switch network 12, such as over a link between two switches 22 or across one group 24. Shimizu at [0023]: In some embodiments, outbound tags are vector based. For vector based outbound tags, each outbound tag may specify a set of output ports. A sequence of these outbound tags in the frame can specify the path(s) of the frame, link by link through switch network 12. Each receiving switch 22 simply identifies the port(s) specified by the current outbound tag, removes the current outbound tag from the frame, and then forwards the frame on the specified port(s). For example, in the illustrated embodiment, switch X.A may receive a frame with vector based outbound tags. The first tag identifies port 4. In order to transmit the frame to the appropriate next switch 22, switch X.A removes the first tag and sends the frame on port 4. This frame would then be received by switch Y.A, and switch Y.A repeats a similar process in order to transmit the frame to the appropriate next switch 22. In one

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Asserted Claims	Shimizu
	embodiment, each vector based tag is a bit map corresponding to the ports of switch 22. In another embodiment, vector based tags may reference memory locations, such as VLAN table entries, that indicate one or more outbound ports. Shimizu at [0024]: In other embodiments, outbound tags are port identification (port ID) based. For port ID based outbound tags, each outbound tag may specify a group/switch/port. A sequence of these outbound tags in the frame specifies the hop from one group 24 either to the next group 24, to an external network (such as internet 18 or external network 20), or to a device (such as management device 14 or network devices 16). With port ID based outbound tags, the “current” outbound tag may persist as the frame passes through a particular group 24 and may be removed when the frame is forwarded outside the particular group 24. For example, in the illustrated embodiment, switch Y.B may receive a frame ultimately destined for network device 16 m, which is connected to switch Z.D. If the frame has port ID based outbound tags, switch Y.B determines the group/switch/port designated by the first tag in the frame. For this example, it may be port Y.C.2. Consider, for example, switch Y.B receiving a frame with an initial tag indicating port Y.C.2. Switch Y.B first evaluates whether the group identification specified by the tag matches the group in which switch Y.B is a member. If so, switch Y.B looks to the switch identification specified by the first tag to determine if the tag identifies switch Y.B (which in this instance, it does not). Because the switch identification specifies another switch in group Y, switch B accesses its routing information to determine the appropriate port on which to send a frame to switch Y.C. Then, switch Y.B forwards the frame on that port with the first tag still part of the frame. Upon receipt of this frame, switch Y.C checks the group identification and switch identification indicated by the tag. In this instance, since the group and switch identification in the tag specify switch Y.C, switch Y.C may remove the first tag from the frame and forward the frame on the port designated by the tag—port 2 in this example. Shimizu at [0030]:

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	Internet 18 and external network 20 represent networks connected to switch network 12 through which messages may be sent and/or received from other elements connected to switch network 12. Internet 18 may be any group of networks connected together, such as a world wide collection of computers and computer networks that can use TCP/IP network protocols to facilitate data transmission and exchange. External network 20 represents another network of devices capable of facilitating communication between devices. For example, external network 20 may include one or more networks such as a telecommunications network, a satellite network, a cable network, local area networks (LANs), wide area networks (WANs), public switched telephone networks, and/or any other appropriate networks. While not expressly illustrated, external network 20 may separately employ a network based routing scheme, similar to that described for switching network 12, for communications within external network 20. Shimizu at [0031]: In the illustrated embodiment, internet 18 connects to switch network 12 through switch Y.B, and external network 20 connects to switch network 12 through switch Z.C. Internet 18 and external network 20 can communicate with network devices 16, management device 18, and each other through switch network 12. Although not illustrated, it is understood that internet 18 and external network 20 can each also be connected to other networks or other devices, components, or elements. While system 10 includes two networks, internet 18 and external network 20, any number and types of networks 16 may be connected to switch network 12. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are

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Asserted Claims	Shimizu
	connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports. Shimizu at [0040]: Group Z and tables 34 and 40, which are illustrated and described with respect to FIGS. 2A-C, are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While routing information is depicted in a tabular form, certain embodiments include routing information stored in any suitable manner. Additionally, while group Z is depicted as having a particular configuration and arrangement of components, it is intended that groups 24 include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network

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Asserted Claims	Shimizu
	Shimizu at [0041]: FIGS. 3A-C illustrate a path of an outbound frame and the corresponding structure of the frame as it passes through various switches 22. FIG. 3A illustrates the path 50 of a frame. In the illustrated embodiment, a frame is sent by management device 14 through four switches 22 that are constituents of three different groups 24 and arrives at external network 20. Management device 14 may structure a frame so that various switches 22 in switch network 12 know which particular direction to route the frame. Management device 14 may do this so that the most efficient route is taken, the route with the least traffic is used, a faulty switch 22 is avoided, or for any suitable reason. Management device 14 may send the frame as a response to a frame sent by external network 20. The route selected by management device 14 may be selected so that external network 20 receives the frame at the same port from which the original message was sent. Shimizu at [0042]: As illustrated, path 50 includes five different hops (1-5). First, management device 14 sends the frame to switch X.A through hop 1. Then, switch X.A sends the frame to switch X.C in hop 2; switch X.C sends the frame to switch Y.C in hop 3; and switch Y.C sends the frame to switch Z.C in hop 4. Finally, switch Z.C sends the frame to external network 20 in hop 5. In some embodiments, the frame is structured to include vector based tags. The structure of a frame with vector based tags is shown in FIG. 3B for each hop (1-5) of path 50. In particular embodiments, the frame is structured to include port ID based tags. The structure of a frame with port ID based tags is shown in FIG. 3C for each hop (1-5) of path 50.
[1.f] add to path or link information when the incoming packet is not forwarded to the external network;	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to add to path or link information when the incoming packet is not forwarded to the external network.

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Asserted Claims	Shimizu																																																																																												
	See, e.g.: Shimizu at Figs. 3A, 3B, 3C FIG. 3A <pre>graph LR MD[MANGEMENT DEVICE 14] -- hop 1 --> S1((SWITCH X.A 22)) S1 -- hop 2 --> S2((SWITCH X.C 22)) S2 -- hop 3 --> S3((SWITCH Y.C 22)) S3 -- hop 4 --> S4((SWITCH Z.C 22)) S4 -- hop 5 --> EN((EXTERNAL NETWORK 20)) subgraph GROUP_X [GROUP X 24] S1 end subgraph GROUP_Y [GROUP Y 24] S3 end subgraph GROUP_Z [GROUP Z 24] S4 end</pre> FIG. 3B <table><thead><tr><th></th><th>52</th><th>54</th><th>56a</th><th>56b</th><th>56c</th><th>56d</th><th>58</th></tr></thead><tbody><tr><td>hop 1</td><td>DA</td><td>SA</td><td>5</td><td>4</td><td>0</td><td>3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>4</td><td>0</td><td>3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>0</td><td>3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>3</td><td></td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td></td><td>PAYLOAD</td></tr></tbody></table> FIG. 3C <table><thead><tr><th></th><th>52</th><th>54</th><th>60a</th><th>60b</th><th>60c</th><th>58</th></tr></thead><tbody><tr><td>hop 1</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>Y.C.0</td><td>Z.C.3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>Z.C.3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td>PAYLOAD</td></tr></tbody></table> <tr><td></td><td> Shimizu at Figs. 2B, 2C: </td></tr>		52	54	56a	56b	56c	56d	58	hop 1	DA	SA	5	4	0	3	PAYLOAD	hop 2	DA	SA	4	0	3		PAYLOAD	hop 3	DA	SA	0	3			PAYLOAD	hop 4	DA	SA	3				PAYLOAD	hop 5	DA	SA					PAYLOAD		52	54	60a	60b	60c	58	hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD	hop 4	DA	SA	Z.C.3			PAYLOAD	hop 5	DA	SA				PAYLOAD		Shimizu at Figs. 2B, 2C:
	52	54	56a	56b	56c	56d	58																																																																																						
hop 1	DA	SA	5	4	0	3	PAYLOAD																																																																																						
hop 2	DA	SA	4	0	3		PAYLOAD																																																																																						
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Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu																						
	34 NETWORK ROUTING TABLE IN SWITCH Z.A 36 <table><tr><th>SWITCH/DEVICE</th><th>OUTBOUND PORT</th></tr><tr><td>B</td><td>1</td></tr><tr><td>C</td><td>2</td></tr><tr><td>D</td><td>2</td></tr><tr><td>N</td><td>4</td></tr><tr><td>P</td><td>5</td></tr><tr><td>Q</td><td>3</td></tr><tr><td>MANAGEMENT DEVICE</td><td>0</td></tr></table> 38 FIG. 2B 40 GROUP ROUTING IN SWITCH Z.A 42 <table><tr><th>GROUP</th><th>OUTBOUND PORT</th></tr><tr><td>X</td><td>0</td></tr><tr><td>Y</td><td>1</td></tr></table> 44 FIG. 2C Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less	SWITCH/DEVICE	OUTBOUND PORT	B	1	C	2	D	2	N	4	P	5	Q	3	MANAGEMENT DEVICE	0	GROUP	OUTBOUND PORT	X	0	Y	1
SWITCH/DEVICE	OUTBOUND PORT																						
B	1																						
C	2																						
D	2																						
N	4																						
P	5																						
Q	3																						
MANAGEMENT DEVICE	0																						
GROUP	OUTBOUND PORT																						
X	0																						
Y	1																						

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Asserted Claims	Shimizu
	memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0021]: For example, in the illustrated embodiment, a frame destined for management device 14 may be received by switch Z.C from external network 20. Switch Z.C may add an inbound tag before forwarding the frame on the port indicated by routing information maintained by switch Z.C, possibly forwarding the frame to switch Y.C. Switch Y.C may forward the frame on the port indicated by its routing information and so on until the frame reaches its destination, management device 14. In other embodiments, each switch 22 receiving an inbound frame adds an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, a receiving switch 22 adds an inbound tag that simply indicates the port on which the receiving switch 22 received the frame, and each subsequent switch 22 that receives the frame may add another inbound tag that indicates the port on which that switch 22 received the frame. In some embodiments, the path a frame has taken through

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Asserted Claims	Shimizu
	switch network 12 can be known by an examination of the inbound tags in the frame and, in some cases, knowledge of the structure of the switch network 12. Shimizu at [0027]: In some embodiments, management device 14 receives network management messages from network devices 16, internet 18, external network 20, and/or switches 22. To control routing of management messages to management device 14, switches 22 within switch network 12 may provide for special handling of received management messages. For example, when a particular switch 22 detects a received network management message, switch 22 may access its routing information to determine a port on which to forward the network management message. In particular embodiments, each switch 22 has an defined port on which network management messages should be sent. The defined port may vary from switch 22 to switch 22. However, a network management message received by switch Z.C, for example, may always travel through the same switches 22 along the same path to reach management device 14. In certain embodiments, one or more of switches 22 add inbound tags to network management messages so that management device 14 knows the port the network management message entered switch network 12 and/or the precise route that each network management message took to reach the management device 14. Shimizu at [0052]: FIG. 4 is a flowchart illustrating a method 80 of processing a network management message received at one of switches 22. In the illustrated embodiment, port ID based tags are added to inbound network management messages so that management device 14 can determine the precise entry point of the network management messages that management device 14 receives. Shimizu at [0054]:

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Asserted Claims	Shimizu
	After calculating the output port for the network management message, switch 22 determines whether switch 22 received the frame from an external link in step 92. If so, switch 22 adds a tag to the frame specifying the input port on which switch 22 received the frame at step 94. If the frame was not received from an external link, method 80 simply proceeds to step 96. Finally, in step 96, switch 22 sends the frame on the output port that was identified in step 90. Then, method 80 returns to step 82, where switch 22 receives another frame. Shimizu at [0055]: The method described with respect to FIG. 4 is merely illustrative, and it is understood that the manner of operation and devices indicated as performing the operations may be modified in any appropriate manner. For example, in some embodiments, port ID based tags are added to inbound network management messages. While the method describes particular steps performed in a specific order, it should be understood that system 10 contemplates any suitable collection and arrangement of elements performing some, all, or none of these steps in any operable order.
[1.g] remove path or link information header when the incoming packet is forwarded to the external network; and	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to remove path or link information header when the incoming packet is forwarded to the external network. <i>See, e.g.:</i> Shimizu at Figs. 3A, 3B, 3C

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Asserted Claims	Shimizu
	FIG. 3A FIG. 3B FIG. 3C Shimizu at [0022]: Outbound tags may be used to determine the particular path a frame should take through switch network 12. For example, management device 14 and network devices 16 can transmit frames with outbound tags in order to define a desired frame path. In some embodiments, any device aware of the outbound tag protocols used by switch network 12 and its constituent switches 22 can transmit a frame with outbound tags. In order to use outbound tags, a transmitting device may add one or more tags to the header of the frame. Each outbound tag

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Asserted Claims	Shimizu
	may enable switch network 12 to transport the frame along a set portion of switch network 12, such as over a link between two switches 22 or across one group 24. Shimizu at [0023]: In some embodiments, outbound tags are vector based. For vector based outbound tags, each outbound tag may specify a set of output ports. A sequence of these outbound tags in the frame can specify the path(s) of the frame, link by link through switch network 12. Each receiving switch 22 simply identifies the port(s) specified by the current outbound tag, removes the current outbound tag from the frame, and then forwards the frame on the specified port(s). For example, in the illustrated embodiment, switch X.A may receive a frame with vector based outbound tags. The first tag identifies port 4. In order to transmit the frame to the appropriate next switch 22, switch X.A removes the first tag and sends the frame on port 4. This frame would then be received by switch Y.A, and switch Y.A repeats a similar process in order to transmit the frame to the appropriate next switch 22. In one embodiment, each vector based tag is a bit map corresponding to the ports of switch 22. In another embodiment, vector based tags may reference memory locations, such as VLAN table entries, that indicate one or more outbound ports. Shimizu at [0024]: In other embodiments, outbound tags are port identification (port ID) based. For port ID based outbound tags, each outbound tag may specify a group/switch/port. A sequence of these outbound tags in the frame specifies the hop from one group 24 either to the next group 24, to an external network (such as internet 18 or external network 20), or to a device (such as management device 14 or network devices 16). With port ID based outbound tags, the “current” outbound tag may persist as the frame passes through a particular group 24 and may be removed when the frame is forwarded outside the particular group 24. For example, in the illustrated embodiment, switch Y.B may receive a frame ultimately destined for network device 16 m, which is connected to switch Z.D. If the frame has port ID based

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Asserted Claims	Shimizu
	outbound tags, switch Y.B determines the group/switch/port designated by the first tag in the frame. For this example, it may be port Y.C.2. Consider, for example, switch Y.B receiving a frame with an initial tag indicating port Y.C.2. Switch Y.B first evaluates whether the group identification specified by the tag matches the group in which switch Y.B is a member. If so, switch Y.B looks to the switch identification specified by the first tag to determine if the tag identifies switch Y.B (which in this instance, it does not). Because the switch identification specifies another switch in group Y, switch B accesses its routing information to determine the appropriate port on which to send a frame to switch Y.C. Then, switch Y.B forwards the frame on that port with the first tag still part of the frame. Upon receipt of this frame, switch Y.C checks the group identification and switch identification indicated by the tag. In this instance, since the group and switch identification in the tag specify switch Y.C, switch Y.C may remove the first tag from the frame and forward the frame on the port designated by the tag—port 2 in this example. Shimizu at [0044]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, four tags 56, and payload 58. Switch X.A receives the frame and extracts tag 56 a. Because tag 56 a contains the value 5, switch X.A sends the frame on port 5 after removing tag 56 a from the frame. So, during hop 2, the frame contains destination address 52, source address 54, three tags 56, and payload 58. After hop 2, switch X.C receives the frame and extracts tag 56 b. As illustrated, tag 56 b contains the value 4. Switch X.C removes tag 56 b from the frame and sends the frame out port 4. During hop 3, the frame contains destination address 52, source address 54, two tags 56, and payload 58. Switch Y.C receives the frame and extracts tag 56 c. Tag 56 c contains the value 0, so switch Y.C sends the frame on port 0 after removing tag 56 c from the frame. For hop 4, the frame contains destination address 52, source address 54, one tag 56, and payload 58. Switch Z.C receives the frame and extracts the last tag 56: tag 56 d. Tag 56 d contains the value 3. Switch Z.C removes tag 56 d from the frame and sends the frame out port 3, after which it is received by external network 20.

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Asserted Claims	Shimizu
	Shimizu at [0045]: The frame structure in FIG. 3B depicts the logical information contained in a number of vector based tags merely for illustrative purposes. However, as discussed above, the vector based tags may include information encoded using any suitable format to permit switches 22 to appropriately identify one or more outbound ports. As noted above, each vector based tag may include a bit vector, a reference to a bit vector stored in memory, or any other data structure suitable to indicate one or more outbound ports. Shimizu at [0050]: Accordingly, the frame contains destination address 52, source address 54, one tag 60 c, and payload 58 during hop 4. Switch Z.C receives the frame and extracts tag 60 c. First, switch Z.C compares the group identification of tag 60 a, “Z,” to its group identification. Finding a match, switch Z.C compares the switch identification of tag 60 c, “C,” to its switch identification. Because there is another match, switch Y.C evaluates the port identification, port 3. Switch Z.C removes tag 60 c and sends the frame on port 3. The frame, during hop 5 contains destination address 52, source address 54, and payload 58. After hop 5, the frame is received by external network 20. Shimizu at [0057]: If the special routing protocol should be used, method 100 proceeds to step 108, where switch 22 extracts (or reads) the first tag in the frame. In some embodiments, the first tag is the tag found nearest the beginning of the frame. In other embodiments, the first tag is merely the first of the frame's tags that switches 22 process. In step 110, switch 22 determines whether the group identification found in the tag is the group to which that particular switch 22 belongs. If the group identification and the group of switch 22 do not match, then switch 22

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Asserted Claims	Shimizu
	removes that first tag from the frame at step 112. In step 114, switch 22 evaluates whether the frame still has any tags. If so, method 100 returns to step 108, where switch 22 reads the first tag in the frame. Otherwise, switch 22 discards the frame in step 116, and, then, method 100 ends. Shimizu at [0058]: If switch 22 determined that the tag's group identification is equal to the group identification of switch 22, method 100 proceeds to step 118. In step 118, switch 22 determines whether the tag's switch identification is equal to the switch identification of switch 22. If so, switch 22 determines that the appropriate output port for the frame is equal to the port identification in the tag at step 120. Switch 22 removes the first tag from the frame in step 122 and sends the frame on the determined output port in step 124; then, method 100 ends. If the tag's switch identification is not equal to the switch identification of switch 22, method 100 proceeds from step 118 to step 126. In step 126, switch 22 accesses routing information stored by switch 22. In some embodiments, switch 22 stores routing information in a tabular form. Switch 22 determines, from the routing information, on which port the frame should be forwarded so that the frame is received by the particular switch 22 identified by the switch identification in the frame, step 128. Switch 22 sends the frame on that output port, step 130, and method 100 ends.
[1.h] forward the incoming packet by using a path or link that corresponds to the identifier from among the plurality of the identifiers.	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to forward the incoming packet by using a path or link that corresponds to the identifier from among the plurality of the identifiers. <i>See, e.g.:</i> Shimizu at Fig. 5:

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Asserted Claims	Shimizu
	<i>FIG. 5</i> <pre> graph TD 102([START]) --> 104[RECEIVE FRAME] 104 --> 108{SPECIAL ROUTING PROTOCOL?} 108 -- NO --> 106[PROCESS FRAME ACCORDING TO STANDARD ROUTING] 108 -- YES --> 110[READ FIRST TAG] 110 --> 112{TAG'S GROUP ID = SWITCH GROUP?} 112 -- YES --> 118{TAG'S SWITCH ID = SWITCH ID?} 112 -- NO --> 114[REMOVE FIRST TAG FROM FRAME] 114 --> 116{TAG EXISTS?} 116 -- YES --> 110 116 -- NO --> 116[DISCARD FRAME] 118 -- YES --> 120{PORT ID IS OUTPUT PORT?} 118 -- NO --> 126[ACCESS ROUTING TABLE] 120 --> 122[REMOVE FIRST TAG FROM FRAME] 122 --> 124[SEND FRAME ON OUTPUT PORT] 126 --> 128[DETERMINE OUTPUT PORT] 128 --> 130[SEND FRAME ON OUTPUT PORT] 106 --> END([END]) 124 --> END 130 --> END 116[DISCARD FRAME] --> END </pre> Shimizu at Figs. 3A, 3B, 3C

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Asserted Claims	Shimizu																																																																																										
	FIG. 3A <pre>graph LR MD[MANGEMENT DEVICE 14] -- hop 1 --> S1((SWITCH X.A 22)) S1 -- hop 2 --> S2((SWITCH X.C 22)) S2 -- hop 3 --> S3((SWITCH Y.C 22)) S3 -- hop 4 --> S4((SWITCH Z.C 22)) S4 -- hop 5 --> EN((EXTERNAL NETWORK 20))</pre> 50 { 24 GROUP X 24 GROUP Y GROUP Z 24 FIG. 3B <table><tr><th></th><th>52</th><th>54</th><th>56a</th><th>56b</th><th>56c</th><th>56d</th><th>58</th></tr><tr><td>hop 1</td><td>DA</td><td>SA</td><td>5</td><td>4</td><td>0</td><td>3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>4</td><td>0</td><td>3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>0</td><td>3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>3</td><td></td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td></td><td>PAYLOAD</td></tr></table> FIG. 3C <table><tr><th></th><th>52</th><th>54</th><th>60a</th><th>60b</th><th>60c</th><th>58</th></tr><tr><td>hop 1</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 2</td><td>DA</td><td>SA</td><td>X.C.4</td><td>Y.C.0</td><td>Z.C.3</td><td>PAYLOAD</td></tr><tr><td>hop 3</td><td>DA</td><td>SA</td><td>Y.C.0</td><td>Z.C.3</td><td></td><td>PAYLOAD</td></tr><tr><td>hop 4</td><td>DA</td><td>SA</td><td>Z.C.3</td><td></td><td></td><td>PAYLOAD</td></tr><tr><td>hop 5</td><td>DA</td><td>SA</td><td></td><td></td><td></td><td>PAYLOAD</td></tr></table>		52	54	56a	56b	56c	56d	58	hop 1	DA	SA	5	4	0	3	PAYLOAD	hop 2	DA	SA	4	0	3		PAYLOAD	hop 3	DA	SA	0	3			PAYLOAD	hop 4	DA	SA	3				PAYLOAD	hop 5	DA	SA					PAYLOAD		52	54	60a	60b	60c	58	hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD	hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD	hop 4	DA	SA	Z.C.3			PAYLOAD	hop 5	DA	SA				PAYLOAD
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hop 5	DA	SA					PAYLOAD																																																																																				
	52	54	60a	60b	60c	58																																																																																					
hop 1	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD																																																																																					
hop 2	DA	SA	X.C.4	Y.C.0	Z.C.3	PAYLOAD																																																																																					
hop 3	DA	SA	Y.C.0	Z.C.3		PAYLOAD																																																																																					
hop 4	DA	SA	Z.C.3			PAYLOAD																																																																																					
hop 5	DA	SA				PAYLOAD																																																																																					
	Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network.																																																																																										

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
	Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a

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Asserted Claims	Shimizu
	group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0013]: FIG. 5 is a flowchart illustrating a method of processing a frame received at a switch in the switch network. Shimizu at [0014]: FIG. 1 illustrates a system, indicated generally at 10, that uses a network based routing scheme to control the path of frames through a switch network. As illustrated, system 10 includes a switch network 12, a management device 14, network devices 16, an internet 18, and an external network 20. The elements of system 10 may interconnect using any suitable techniques or protocols. In general, elements within system 10 interoperate to control the path frames take through switch network 12. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network.

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Asserted Claims	Shimizu
	Shimizu at [0020]: In operation, devices can control the path of frames through switch network 12 using tags in the frames. Frames may include header information indicating that the frame contains these tags. In some embodiments, two types of tags exist: inbound tags and outbound tags. Inbound tags may be used, for example, when a frame enters switch network 12 to ensure that responses to the frame are sent from switch network 12 on the same port that originally received the frame. When an inbound frame enters switch network 12 at a specific port, the receiving switch 22 may add an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, switch 22 will add an inbound tag only to frames that switch 22 receives from outside switch network 12. Shimizu at [0021]: For example, in the illustrated embodiment, a frame destined for management device 14 may be received by switch Z.C from external network 20. Switch Z.C may add an inbound tag before forwarding the frame on the port indicated by routing information maintained by switch Z.C, possibly forwarding the frame to switch Y.C. Switch Y.C may forward the frame on the port indicated by its routing information and so on until the frame reaches its destination, management device 14. In other embodiments, each switch 22 receiving an inbound frame adds an inbound tag indicating the group/switch/port that received the frame. In particular embodiments, a receiving switch 22 adds an inbound tag that simply indicates the port on which the receiving switch 22 received the frame, and each subsequent switch 22 that receives the frame may add another inbound tag that indicates the port on which that switch 22 received the frame. In some embodiments, the path a frame has taken through switch network 12 can be known by an examination of the inbound tags in the frame and, in some cases, knowledge of the structure of the switch network 12. Shimizu at [0022]:

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Asserted Claims	Shimizu
	Outbound tags may be used to determine the particular path a frame should take through switch network 12. For example, management device 14 and network devices 16 can transmit frames with outbound tags in order to define a desired frame path. In some embodiments, any device aware of the outbound tag protocols used by switch network 12 and its constituent switches 22 can transmit a frame with outbound tags. In order to use outbound tags, a transmitting device may add one or more tags to the header of the frame. Each outbound tag may enable switch network 12 to transport the frame along a set portion of switch network 12, such as over a link between two switches 22 or across one group 24. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20,

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Asserted Claims	Shimizu
	or any other networks, components, elements, or devices. While depicted as having only six ports, it is understood that switches 22 can include any suitable number of ports. Shimizu at [0037]: For example, switch Z.A may receive a frame with port ID based outbound tags. Switch Z.A looks at the first tag and determines whether the tag's group identification is equal to group Z. If so, switch Z.A determines whether the tag's switch identification is equal to switch Z.A. If the tag's switch identification is the same as the switch identification for switch Z.A, then switch Z.A strips the first tag from the frame and forwards the frame on the port identified by the tag. Otherwise, switch Z.A knows that the switch identified by the tag's switch identification should receive this frame. By reference to network routing table 34, switch Z.A can determine the appropriate outbound port for the frame so that it reaches the switch identified by the tag. Shimizu at [0039]: FIG. 2C illustrates an example of group routing information that may be stored and maintained by switch Z.A. As illustrated, switch network 12 includes group Z, group Y, and group X. In many embodiments, switch Z.A does not maintain routing information for switches 22 located in group Y or group X. Accordingly, in particular embodiments, switch Z.A maintains a table 40 providing routing information for group Y, as a whole, and group X, as a whole. The basic routing information for each group 24, listed by column 42, is correlated to an outbound port, listed by column 44. Thus, switch Z.A may maintain table 40 to specify a particular outbound port for frames addressed for group X: port 0 in the illustrated embodiment. In particular embodiments, the basic routing information for other groups 24 is stored in a variety of different formats, and the use of table 40 is intended to be illustrative and not limiting. While illustrated as having only two groups 24 stored, table 40 may include routing information corresponding to any number of different groups 24,

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Asserted Claims	Shimizu
	devices, networks, etc. In some embodiments, switches 22 do not store group routing information. Shimizu at [0043]: FIG. 3B shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a vector based tag indicating the next switch 22 in path 50. As illustrated, a frame includes a destination address 52, a source address 54, one or more (or no) tags 56, and a payload 58. Destination address 52 may be a representation in any appropriate format or protocol of the destination of the frame. Source address 54, similarly, may be a representation in any appropriate format or protocol of the source of the frame. Tags 56 operate control the path of frames through switch network 12. Payload 58 represents any type of information and may include all information not contained in the header of the frame. In some embodiments, payload 58 is simply the information to be transmitted by the frame. In other embodiments, payload 58 represents any information not processed or analyzed by switches 22. Shimizu at [0044]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, four tags 56, and payload 58. Switch X.A receives the frame and extracts tag 56 a. Because tag 56 a contains the value 5, switch X.A sends the frame on port 5 after removing tag 56 a from the frame. So, during hop 2, the frame contains destination address 52, source address 54, three tags 56, and payload 58. After hop 2, switch X.C receives the frame and extracts tag 56 b. As illustrated, tag 56 b contains the value 4. Switch X.C removes tag 56 b from the frame and sends the frame out port 4. During hop 3, the frame contains destination address 52, source address 54, two tags 56, and payload 58. Switch Y.C receives the frame and extracts tag 56 c. Tag 56 c contains the value 0, so switch Y.C sends the frame on port 0 after removing tag 56 c from the frame. For hop 4, the frame contains

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Asserted Claims	Shimizu
	destination address 52, source address 54, one tag 56, and payload 58. Switch Z.C receives the frame and extracts the last tag 56: tag 56 d. Tag 56 d contains the value 3. Switch Z.C removes tag 56 d from the frame and sends the frame out port 3, after which it is received by external network 20. Shimizu at [0045]: The frame structure in FIG. 3B depicts the logical information contained in a number of vector based tags merely for illustrative purposes. However, as discussed above, the vector based tags may include information encoded using any suitable format to permit switches 22 to appropriately identify one or more outbound ports. As noted above, each vector based tag may include a bit vector, a reference to a bit vector stored in memory, or any other data structure suitable to indicate one or more outbound ports. Shimizu at [0046]: FIG. 3C shows the corresponding structure of a frame through the various hops (1-5) of path 50. In the illustrated embodiment, the frame is structured with a port ID based tag indicating the next group 24 in path 50. As illustrated, a frame includes destination address 52, source address 54, one or more (or no) tags 60, and payload 58. In some embodiments, destination address 52, source address 54, and payload 58 are similar to those represented in FIG. 3B. Tags 60 operate control the path of frames through switch network 12. Shimizu at [0047]: The frame corresponding to hop 1 represents the structure of the frame sent from management device 14 to switch X.A. During hop 1, the frame contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.A receives the frame and extracts tag 60 a. Tag 60 a specifies port X.C.4: port 4 of switch X.C. Switch X.A first

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Asserted Claims	Shimizu
	compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.A then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is no match, switch X.A looks to its routing information to determine the appropriate outbound port for a frame destined for switch X.C. Switch X.A identifies port 5 as the correct port and sends the frame on port 5 towards switch X.C. In the illustrated embodiment, switch X.A does not remove tag 60 a from the frame because there was no match of the switch identification in tag 60 a and the switch identification of switch X.A. Shimizu at [0048]: During hop 2, the frame still contains destination address 52, source address 54, three tags 60, and payload 58. Switch X.C receives the frame and extracts tag 60 a. Switch X.C first compares the group identification of tag 60 a, “X,” to its group identification. Finding there is a match, switch X.C then compares the switch identification of tag 60 a, “C,” to its switch identification. Because there is a match, switch X.C evaluates the port identification, which is 4. Switch X.C first removes tag 60 a, and then sends the frame on port 4 towards switch Y.C. Shimizu at [0049]: For hop 3, the frame contains destination address 52, source address 54, two tags 60, and payload 58. Switch Y.C receives the frame and extracts tag 60 b. Switch Y.C, similarly, first compares the group identification of tag 60 a, “Y,” to its group identification. Finding there is a match, switch Y.C then compares the switch identification of tag 60 b, “C,” to its switch identification. Because there is a match, switch Y.C evaluates the port identification, which indicates port 0. Switch Y.C removes tag 60 b and sends the frame on port 0. Shimizu at [0050]:

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Asserted Claims	Shimizu
	Accordingly, the frame contains destination address 52, source address 54, one tag 60 c, and payload 58 during hop 4. Switch Z.C receives the frame and extracts tag 60 c. First, switch Z.C compares the group identification of tag 60 a, “Z,” to its group identification. Finding a match, switch Z.C compares the switch identification of tag 60 c, “C,” to its switch identification. Because there is another match, switch Y.C evaluates the port identification, port 3. Switch Z.C removes tag 60 c and sends the frame on port 3. The frame, during hop 5 contains destination address 52, source address 54, and payload 58. After hop 5, the frame is received by external network 20. Shimizu at [0051]: The devices and frame configurations illustrated and described with respect to FIGS. 3A-C are merely illustrative. It is understood that the manner of operation and devices indicated as performing different operations may be modified in any appropriate manner. While frames are depicted as incorporating a particular protocol and structure, the frames in certain embodiments are structured in any suitable manner and utilize any protocols. Specifically, while frames are shown with destination address 52, source address 54, and payload 58, certain embodiments contemplate any frame structure accompanying tags that control the path of frames through switch network 12. Additionally, while the path taken by a frame depicted as having a particular set of switches 22, it is intended that this path include any suitable devices appropriately arranged to provide for a system that controls the paths of frames through a network
2. The packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined domain. <i>See claim 1.</i> <i>See, e.g.:</i>

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Asserted Claims	Shimizu
	Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]:

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Asserted Claims	Shimizu
	Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take through a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22:

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Asserted Claims	Shimizu
	switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
3. The packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined local domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined local domain. <i>See claim 1.</i> <i>See, e.g.:</i> Shimizu at [0004]:

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Asserted Claims	Shimizu
	In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a

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Asserted Claims	Shimizu
	private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n.

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Asserted Claims	Shimizu
	Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
4. The packet forwarding node according to claim I [sic], wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within the packet forwarding node.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within the packet forwarding node. <i>See claim 1.</i> <i>See, e.g.:</i> Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme

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Asserted Claims	Shimizu
	and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the

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	switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of

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	networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
5. The packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which unique identifies the link among the packet forwarding nodes.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which unique identifies the link among the packet forwarding nodes. <i>See claim 1.</i> <i>See, e.g.:</i> Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network.

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Asserted Claims	Shimizu
	Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into

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Asserted Claims	Shimizu
	groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20,

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Asserted Claims	Shimizu
	or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
[6.pre] 6. A packet forwarding node, comprising:	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, a packet forwarding node. <i>See, e.g.:</i> <i>See claim 1.pre.</i>
[6.a] a storage unit including a non-transitory computer readable medium configured to store a packet forwarding table used for forwarding a packet based on an identifier which identifies an interface of a packet forwarding node; and	Shimizu discloses, expressly and/or inherently, a packet forwarding node, comprising, a storage unit including a non-transitory computer readable medium configured to store a packet forwarding table used for forwarding a packet based on an identifier which identifies an interface of a packet forwarding node. <i>See claim 1.a.</i> <i>See, e.g.:</i> Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]:

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Asserted Claims	Shimizu
	According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some

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Asserted Claims	Shimizu
	embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]:

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Asserted Claims	Shimizu
	As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
[6.b] at least one processor configured to execute program instructions to provide a forwarding unit configured to receive an incoming packet including a plurality of identifiers, determine a direction to forward the incoming packet, determine whether to forward to an external network, add to path or link information when the incoming packet is not forwarded to the external network, remove path or link information header when the incoming packet is forwarded to the external network, and to forward the incoming packet by using a path or link that corresponds to the identifier from among the plurality of identifiers.	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute program instructions to provide a forwarding unit configured to receive an incoming packet including a plurality of identifiers, determine a direction to forward the incoming packet, determine whether to forward to an external network, add to path or link information when the incoming packet is not forwarded to the external network, remove path or link information header when the incoming packet is forwarded to the external network, and to forward the incoming packet by using a path or link that corresponds to the identifier from among the plurality of identifiers. <i>See claims 1.b–1.h.</i>
7. The packet forwarding node according to claim 6, wherein the storage unit stores the table used for	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined domain.

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Asserted Claims	Shimizu
forwarding the packet based on the identifier which uniquely identifies the link within a predetermined domain.	<i>See claims 2, 6.</i>
8. The packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined local domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within a predetermined local domain. <i>See claims 3, 6.</i>
9. The packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within the packet forwarding node.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link within the packet forwarding node. <i>See claims 4, 6.</i>
10. The packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 6, wherein the storage unit stores the table used for forwarding the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes. <i>See claims 5, 6.</i>

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Asserted Claims	Shimizu
[11.pre] 11. A packet forwarding node, comprising:	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, a packet forwarding node. <i>See claim 6.pre.</i>
[11.a] a memory storing a program;	Shimizu discloses, expressly and/or inherently, a packet forwarding node, comprising a memory storing a program. <i>See claim 1.a.</i> <i>See, e.g.:</i> Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network.
[11.b] at least one processor configured to execute the program to provide:	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute a program. <i>See claim 1.b.</i> <i>See, e.g.:</i>

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Asserted Claims	Shimizu
	Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network.
[11.c] a communication unit configured to communicate with a server for receiving a plurality of identifiers, each of which identifies a link between nodes on a packet forwarding path; and	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute a program to provide a communication unit configured to communicate with a server for receiving a plurality of identifiers, each of which identifies a link between nodes on a packet forwarding path. <i>See claim 1.a</i> <i>See, e.g.:</i> Shimizu at [0026]: As illustrated, system 10 also includes management device 14 connected to switch network 12 through switch X.A. Management device 14 may control the operation of switch network 12 and/or the interoperation between different switches 22 within switch network 12. In particular embodiments, management device 14 performs an initial configuration of switch network 12. The initial configuration separates switches 22 into groups 24, assigns a switch identification to each switch 22, assigns a group identification to each group 24, and distributes to each switch 22 the switch identification and the group identification corresponding to that particular switch 22. Also, management device 14 may send the initial configuration results to any other devices that may use the network based routing scheme.

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Asserted Claims	Shimizu
	Management device 14 may perform the initial configuration in any appropriate manner, including either an automated or a manual method.
[11.d] a forwarding unit configured to:	Shimizu discloses, expressly and/or inherently, a forwarding unit. <i>See claim 1.b.</i>
[11.e] receive an incoming packet including the plurality of the identifiers,	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to receive an incoming packet including the plurality of the identifiers. <i>See claim 1.c.</i>
[11.f] determine a direction to forward the incoming packet,	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to receive an incoming packet including the plurality of the identifiers. <i>See claim 1.d.</i>
[11.g] determine whether to forward to an external network,	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to determine whether to forward to an external network. <i>See claim 1.e.</i>
[11.h] add to path or link information when the incoming packet is not forwarded to the external network,	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to add to path or link information when the incoming packet is not forwarded to the external network. <i>See claim 1.f.</i>
[11.i] remove path or link information header when the incoming packet is forwarded to the external network, and	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to remove path or link information header when the incoming packet is forwarded to the external network. <i>See claim 1.g.</i>

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Asserted Claims	Shimizu
[11.j] forward the incoming packet by using a path or link that corresponds to an identifier from among the plurality of identifiers.	Shimizu discloses, expressly and/or inherently, a forwarding unit configured to remove path or link information header when the incoming packet is forwarded to the external network. <i>See claim 1.h.</i>
12. The packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined domain. <i>See claims 2, 7, 11.</i>
13. The packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined local domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined local domain. <i>See claims 3, 8, 11.</i>
14. The packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within the packet forwarding node.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within the packet forwarding node. <i>See claims 4, 9, 11.</i>
15. The packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 11, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes. <i>See claims 5, 10, 11.</i>

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Asserted Claims	Shimizu
[16.pre] 16. A packet forwarding node, comprising:	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, a packet forwarding node. <i>See claim 6.pre.</i>
[16.a] a communication unit configured to communicate with a server for receiving a plurality of identifiers, each of which identifies an interface of the packet forwarding node; and	Shimizu discloses, expressly and/or inherently, a packet forwarding node comprising a communication unit configured to communicate with a server for receiving a plurality of identifiers, each of which identifies an interface of the packet forwarding node. <i>See claims 6.a, 11.c.</i>
[16.b] at least one processor configured to execute program instructions to provide a forwarding unit configured to receive an incoming packet including a plurality of identifiers, determine a direction to forward the incoming packet, determine whether to forward to an external network, add to path or link information when the incoming packet is not forwarded to the external network, remove path or link information header when the incoming packet is forwarded to the external network, and forward the incoming packet by using a path or link that corresponds to an identifier from among the plurality of identifiers.	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute program instructions to provide a forwarding unit configured to receive an incoming packet including a plurality of identifiers, determine a direction to forward the incoming packet, determine whether to forward to an external network, add to path or link information when the incoming packet is not forwarded to the external network, remove path or link information header when the incoming packet is forwarded to the external network, and forward the incoming packet by using a path or link that corresponds to an identifier from among the plurality of identifiers. <i>See claims 1.b–1.h.</i>

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Asserted Claims	Shimizu
17. The packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined domain. <i>See claims 2, 7, 12, 16.</i>
18. The packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined local domain.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within a predetermined local domain. <i>See claims 3, 8, 13, 16.</i>
19. The packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within the packet forwarding node.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link within the packet forwarding node. <i>See claims 4, 9, 14, 16.</i>
20. The packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 16, wherein the forwarding unit forwards the packet based on the identifier which uniquely identifies the link among the packet forwarding nodes. <i>See claims 5, 10, 15, 16.</i>
[21.pre] 21. A server, comprising:	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, a server. <i>See, e.g.:</i>

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Asserted Claims	Shimizu
	Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0026]: As illustrated, system 10 also includes management device 14 connected to switch network 12 through switch X.A. Management device 14 may control the operation of switch network 12 and/or the interoperation between different switches 22 within switch network 12. In particular embodiments, management device 14 performs an initial configuration of switch network 12. The initial configuration separates switches 22 into groups 24, assigns a switch identification to each switch 22, assigns a group identification to each group 24, and distributes to each switch 22 the switch identification and the group identification corresponding to that particular switch 22. Also, management device 14 may send the initial configuration results to any other devices that may use the network based routing scheme. Management device 14 may perform the initial configuration in any appropriate manner, including either an automated or a manual method. Shimizu at [0029]: Network devices 16 represent any device connectable to switch network 12. For example, network devices 16 may include personal computers, servers, file storage, network printers, and other network enabled devices. Network devices 16 communicate with other network

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Asserted Claims	Shimizu
	devices 16, management device 14, internet 18, and external network 20 through switch network 12. Although not illustrated, network devices 16 can also be connected to other networks or other devices, components, or elements. As illustrated, system 10 includes three network devices: 16 l, 16 m, and 16 n. Network device 16l connects to switch network 12 through switch Y.B; network device 16 m connects to switch network 12 through switch Z.D; and network device 16 n connects to switch network 12 through switch Z.A. While system 10 includes three network devices 16, it is understood that any number and type of network devices 16 may be connected to switch network 12. Shimizu at [0032]: Particular embodiments of system using a network based routing scheme have been described and are not intended to be all-inclusive. While system 10 is depicted as containing a certain configuration and arrangement of elements, it should be noted that this is a logical depiction, and the components and functionality of system 10 may be combined, separated and distributed as appropriate both logically and physically. Also, the functionality of system 10 may be provided by any suitable collection and arrangement of components. The described and illustrated organization, number, and structure of switches 22 in switch network 12 is merely illustrative. Switches 22 may be organized and structured in any suitable manner and may include any suitable number or type of devices, and switch network 12 may include any appropriate configuration and number of groups 24. System 10 may be structured in any suitable manner to control the path of frames through switch network 12.
[21.a] a memory storing a computer program;	Shimizu discloses, expressly and/or inherently, a memory storing a computer program. <i>See claim 11.a.</i>
[21.b] at least one processor configured to execute the computer program to provide:	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute the computer program.

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Asserted Claims	Shimizu
	<i>See claim 11.b.</i>
[21.c] a first unit configured to determine a plurality of identifiers, each of which identifies a link between nodes on a packet forwarding path; and	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute the computer program to provide a first unit configured to determine a plurality of identifiers, each of which identifies a link between nodes on a packet forwarding path. <i>See claims 1.a, 1.c.</i>
[21.d] a second unit configured send information elements to a packet forwarding node which is capable of receiving an incoming packet including a plurality of identifiers, determining a direction to forward the incoming packet, determining whether to forward to an external network, adding to path or link information when the incoming packet is not forwarded to the external network, removing path or link information header when the incoming packet is forwarded to the external network, and forwarding the incoming packet by using a path or link, that corresponds to an identifier from among the plurality of identifiers.	Shimizu discloses, expressly and/or inherently, at least one processor configured to execute the computer program to provide a second unit configured send information elements to a packet forwarding node which is capable of receiving an incoming packet including a plurality of identifiers, determining a direction to forward the incoming packet, determining whether to forward to an external network, adding to path or link information when the incoming packet is not forwarded to the external network, removing path or link information header when the incoming packet is forwarded to the external network, and forwarding the incoming packet by using a path or link, that corresponds to an identifier from among the plurality of identifiers.. <i>See claims 1.b–1.h.</i>
22. The packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which identifies the link	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein the storage unit stores the table used for forwarding the packet based on the identifier which identifies the link between adjacent nodes on a packet forwarding path.

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Asserted Claims	Shimizu
between adjacent nodes on a packet forwarding path.	<i>See</i> claim 1. <i>See, e.g.:</i> Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port

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Asserted Claims	Shimizu
	corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol. Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network.

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Asserted Claims	Shimizu
	Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
23. The packet forwarding node according to claim 6, wherein the storage unit stores the packet forwarding table used for forwarding the packet based on the identifier which identifies the link	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 6, wherein the storage unit stores the packet forwarding table used for forwarding the packet based on the identifier which identifies the link between adjacent nodes on a packet forwarding path.

Exhibit F3 – Shimizu Invalidity Claim Chart for the '249 Patent

Asserted Claims	Shimizu
between adjacent nodes on a packet forwarding path.	<i>See</i> claims 6, 22. Shimizu at [0004]: In accordance with the present invention, techniques for a network based routing scheme are provided. According to particular embodiments, these techniques describe a routing scheme and network organization that enable a private network to control the path frames take through the private network. Shimizu at [0005]: According to a particular embodiment, a method for routing frames comprises receiving frames using a group of ports of a switch. Each frame includes a source address, a destination address, and a payload. At least some portion of the frames also include one or more tags, where each tag specifies a group identification, a switch identification, and a port identification. The switch is part of a switch group, and the switch group is part of a switch network. The method also comprises maintaining routing information in the switch indicating an output port corresponding to each other switch in the switch group. For each frame, the method comprises operating in a first mode of operation if the frame conforms to a special routing protocol, and, otherwise, operating in a second mode of operation. In the first mode of operation, a first tag in the frame is read. Whether the first tag's switch identification corresponds to the switch is determined. If the switch identification does not correspond to the switch, the routing information is accessed to determine the output port corresponding to the switch identification, and the frame is transmitted on the determined one of the ports. If the switch identification corresponds to the switch, the frame is transmitted on the port corresponding to the first tag's port identification. In the second mode of operation, the frame is processed according to a standard routing protocol.

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	Shimizu at [0006]: Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take though a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A

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	illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22: switch Z.A, switch Z.B, switch Z.C, and switch Z.D. The constituent switches 22 are connected by intra-group links 30 and external links 32. Intra-group links 30 connect constituent switches 22 to other constituent switches 22, and external links 32 connect constituent switches 22 to switches 22 in other groups 24 and network devices 16 m,n. Although not illustrated, external links 32 can connect constituent switches 22 to a variety of networks, components, elements, or devices, including, for example, other network devices 16, management device 14, internet 18, and external network 20. Shimizu at [0034]: As illustrated, switch Z.A has six intra-group links 30 and external links 32, designated by ports 0 through 5. In the illustrated embodiment, port 0 is connected to switch X.B; port 1 is connected to switch Z.B; port 2 is connected to switch Z.D; and port 4 is connected to network device 16 n. These connections between switch Z.A. and other devices or networks can be accomplished by any suitable logic or devices employing any suitable communications or protocols. While not illustrated, ports 3 and 5 may be connected any network devices 16, switches 22, networks, for example internet 18 or external network 20, or any other networks, components, elements, or devices. While depicted has having only six ports, it is understood that switches 22 can include any suitable number of ports.
24. The packet forwarding node according to claim 11, further comprising a storage unit that stores a table used for forwarding the packet based on an identifier which identifies the link between adjacent nodes on a packet forwarding path.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 11, further comprising a storage unit that stores a table used for forwarding the packet based on an identifier which identifies the link between adjacent nodes on a packet forwarding path. <i>See claims 11, 22.</i>
25. The packet forwarding node according to claim 16, further comprising a storage unit that stores	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 16, further comprising a storage unit that stores a table used for forwarding the packet

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a table used for forwarding the packet based on an identifier which identifies the link between adjacent nodes on a packet forwarding path.	based on an identifier which identifies the link between adjacent nodes on a packet forwarding path. <i>See claims 16, 22.</i>
[26.a] 26. The server according to claim 21, further comprising a storage unit to store a packet forwarding table used for forwarding the incoming packet based on the identifier which identifies the link between nodes on the packet forwarding path,	Dell takes no position in these Invalidity Contentions on whether the entirety of the preamble of this claim is a limitation. To the extent it is a limitation, Shimizu discloses, expressly and/or inherently, the server according to claim 21, further comprising a storage unit to store a packet forwarding table used for forwarding the incoming packet based on the identifier which identifies the link between nodes on the packet forwarding path. <i>See claims 1.a, 21.</i>
[26.b] wherein the storage unit stores the table used for forwarding the packet based on the identifier which identifies a link between adjacent nodes on a packet forwarding path.	Shimizu discloses, expressly and/or inherently, the server according to claim 21, wherein the storage unit stores the table used for forwarding the packet based on the identifier which identifies a link between adjacent nodes on a packet forwarding path. <i>See claim 22.</i>
27. The packet forwarding node according to claim 1, wherein when the forwarding unit receives the incoming packet including the identifier for the link connecting nodes on the packet forwarding path, the forwarding unit forwards the incoming packet based on the identifier included the received incoming packet from among the plurality of the identifiers.	Shimizu discloses, expressly and/or inherently, the packet forwarding node according to claim 1, wherein when the forwarding unit receives the incoming packet including the identifier for the link connecting nodes on the packet forwarding path, the forwarding unit forwards the incoming packet based on the identifier included the received incoming packet from among the plurality of the identifiers. <i>See claim 1.</i> <i>See, e.g.:</i>

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	Embodiments of the invention provide various technical advantages. For example, these techniques may allow a device to specify a particular path that a frame should take through a private network. These private routing techniques can work in conjunction with widely used routing techniques, such as Ethernet routing. For example, within a private network, the switches can use private network routing protocols in place of Ethernet routing for selected network traffic. In particular embodiments, switches within a private network are divided into groups, and a specific port of a specific one of the switches can be uniquely referenced by a tag that indicates a group, a switch, and a port identifier. This can permit switches within a group to maintain private routing tables defined for only other switches in the group. In some embodiments, appropriate routing can be enabled with smaller routing tables that require less memory in a switch. Also, in particular embodiments, a tag can be added to a frame entering a private network to ensure that responses to the frame leave the private network on the exact same port. Shimizu at [0015]: Switch network 12 includes switches 22 and represents any suitable collection of hardware, software, and controlling logic that interconnect switches 22 and elements coupled to switch network 12. Thus, switch network 12 provides an infrastructure to support communications between attached devices. As illustrated, switch network 12 includes switches 22 organized into groups 24. In some embodiments, switch network 12 is a private network that allows devices to specifically determine the path of a frame through the network. Shimizu at [0033]: FIGS. 2A-C illustrate one of groups 24, group Z, employing a network based routing scheme and sample network routing tables corresponding to switch Z.A in group Z. FIG. 2A illustrates an embodiment of one of groups 24, group Z, and its constituent switches 22:

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