

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

ZTE (USA) Inc.,

Petitioner,

v.

WSOU Investments LLC D/B/A Brazos Licensing and Development,

Patent Owner.

Case No. IPR2023-00499

U.S. Patent No. 7,872,973

Issue Date: Jan. 18, 2011

**PETITION FOR *INTER PARTES* REVIEW
OF U.S. PATENT NO. 7,872,973**

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I. STATEMENT OF RELIEF REQUESTED FOR EACH CLAIM

ZTE (USA) Inc. (Petitioner) requests *inter partes* review of claims 1-31 of U.S. Patent No. 7,872,973 (Ex. 1001), assigned to WSOU Investments LLC (“WSOU”) under 35 U.S.C. § 311 based on the following grounds and prior art:

Exhibit/ Name	Number	Filing Date	Publication Date	Prior Art Provision
1005 “ <i>Ma</i> ”	7,369,498	Aug. 6, 2002	May 6, 2008	Pre-AIA 102(e)
1006 “ <i>Kim</i> ”	2005/0157723	Dec. 13, 2004	Jul. 21, 2005	Pre-AIA 102(a), (e)
1007 “ <i>Enomoto</i> ”	2005/0213504	Feb. 23, 2005	Sep. 29, 2005	Pre-AIA 102(a), (e)
1008 “ <i>McCrosky</i> ”	7,391,787	Sep. 10, 2004	Jun. 24, 2008	Pre-AIA 102(e)
Grounds	Prior Art			
1a	<i>Ma</i> Renders Obvious Claims 1, 2, 4-10, 12-16, 18-20, 22-27, 29-31			
1b	<i>Ma</i> in view of <i>Kim</i> Renders Obvious Claims 1, 2, 4-10, 12-16, 18-20, 22-27, 29-31			
2	<i>Ma</i> in view of <i>Enomoto</i> (Ground 2A) or alternatively, <i>Ma</i> in view of <i>Kim</i> and <i>Enomoto</i> (Ground 2B) Renders Obvious Claims 3, 11, 21, 28			

3	<i>Ma</i> in view of <i>McCrosky</i> (Ground 3A) or alternatively, <i>Ma</i> in view of <i>Kim</i> and <i>McCrosky</i> (Ground 3B) Renders Obvious Claim 17
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II. THE '973 PATENT

A. Overview

The '973 patent discloses only a trivial modification, if even a modification at all, over the prior art—reducing the rate at which an upstream device sends packets to a queuing device. Ex. 1003, ¶ 38.

The '973 patent introduces a "method for incorporating a queuing device as a lossless processing stage in a network device in a communications network between an upstream device and a downstream device in the network device." Ex-1001, Claim 1; Ex. 1003, ¶ 39.

The '973 patent discloses steps beginning with “monitoring a depth of a queue in the queuing device, wherein the queue receives packets from the upstream device within the network device.” Ex. 1001, claim 1. “[T]he queuing device acts as a discard point by discarding packets when the queue is full.” *Id.* Finally, “if the depth of the queue passes a predetermined threshold,” then the claimed method “prevent[s] packet discarding and loss by the queuing device” by “sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device.” *Id.*; Ex. 1003, ¶ 40.

B. Prosecution History

During prosecution, Applicant admitted that changing a transmission rate was known. Ex-1002, 51. Applicant admitted that in the cited art, a “**mobile station** is the device that changes its transmission rate.” *Id.* (emphasis in original). To convince the Examiner to issue a notice of allowance, Applicant recognized that the only aspect of the independent claims that deviates from the cited art is “sending a message to the **upstream** device to **reduce** a rate at which packets are sent ... to **prevent the queue from filling.**” *Id.*, 50 (emphasis in original). The only purported point of novelty during prosecution was the upstream device being the device that adjusts the transmission rate. Ex. 1003, ¶ 41.

C. Level of Ordinary Skill

A POSITA would have had at least a bachelor’s degree in electrical engineering, computer engineering, or a related engineering discipline and two or more years of industry experience in the field of telecommunications, or equivalent experience, education, or both. Lack of professional experience could be remedied by additional education, and lack of education could be remedied by additional professional experience. Ex. 1003, ¶ 42.

III. CLAIM CONSTRUCTION

Only claim terms “in controversy” need be construed in an IPR “and only to the extent necessary to resolve the controversy.” *Nidec Motor Corp. v. Zhongshan*

Broad Ocean Motor Co., 868 F.3d 1013, 1017 (Fed. Cir. 2017) (citation omitted), *cert. denied*, 138 S. Ct. 1695 (2018).

A. Terms Found Indefinite in Prior Litigation Do Not Preclude Review by the Board Here

The district court in *WSOU Investments LLC D/B/A Brazos Licensing and Dev., v. Huawei Technologies Co., LTD.*, 6-20-cv-00538, Dkt. 61 (W.D. Tex. Jun. 17, 2020) construed several terms in the '973 patent and found two terms—"the message" (claim [1g], also recited in claim [19i]) and "a module for, if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling, thereby preventing packet discarding and loss by the queuing device"—indefinite. Ex. 1012, 14, 16. Although the terms were construed as indefinite, the parties settled before a final judgment of invalidity was entered.

After the terms were construed as indefinite, Patent Owner filed suit against Petitioner. Therefore, assuming Patent Owner had a reasonable basis to file its lawsuit against Petitioner, Patent Owner must disagree with the Court's prior constructions and believes these terms to be definite. Based on the Patent Owner's necessary disagreement, Petitioner construes these terms consistent with Patent Owner's assertions in its prior case. To the extent this IPR cannot be instituted

because the terms are indefinite, the patent must necessarily be invalid because of its indefiniteness.

For the first term, “the message,” the Patent Owner argued the term was entitled to its plain and ordinary meaning because “the message” in [1g] uses “a message” in [1e] as its antecedent. Ex. 1013, 10. Although Petitioner does not agree, using this logic, which Patent Owner asserted is consistent with the specification at Ex. 1001, 7:7-12, it is clear the prior art discloses this limitation.

For the second term, “a module for, if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling, thereby preventing packet discarding and loss by the queuing device,” the Patent Owner argued the term was entitled to its plain and ordinary meaning before the district court, noting that limitations that do not use the term “means” are presumed not to be subject to interpretation as means-plus-function. *Williamson v. Citrix Online, LLC*, 792 F.3d 1339, 1348 (Fed. Cir. 2015) (en banc); Ex. 1013, 11. This presumption applies before the Board as well. *Abbott Diabetes Care Inc. v. DexCom, Inc.*, IPR2022-00922, Paper 13 at 12 (PTAB Nov. 3, 2022) (citing *Zeroclick, LLC v. Apple Inc.*, 891 F.3d 1003, 1008 (Fed. Cir. 2018)).

Nonetheless, because this term that may be construed as a means-plus-function, 37 C.F.R. § 42.104(b)(3) requires a petitioner to “identify the specific

portions of the specification that describe the structure, material, or acts corresponding to each claimed function.” Whether Petitioner identifies structure compliant with 37 C.F.R. § 42.104(b)(3) is a separate inquiry from whether the identified structure is sufficiently definite, and a finding that the term may be indefinite does not preclude review so long as the Board is “able to construe the disputed claim term with sufficient precision to address the obviousness arguments.” *Zillow Grp., Inc. v. Int’l Bus. Machs. Corp.*, IPR2020-01656, Paper 8 at 11 (PTAB Mar. 15, 2021) (“Patent Owner cites no authority nor are we aware of any authority for the proposition that we may not assess the patentability of claims in an *inter partes* review because the Petitioner also challenges those claims as indefinite in District Court.”); *Target Corp. v. Proxicom Wireless, LLC*, IPR2020-00931, Paper 10 at 9 (PTAB Nov. 10, 2020) (noting that “[a]lternative pleading before a court is common practice”); *Alcon Inc. v. AMO Dev., LLC*, IPR2021-00843, Paper 15 at 16 (PTAB Nov. 12, 2021) (instituting review despite petitioner’s allegation before the district court that the claim is indefinite when the Board was “able to construe the disputed claim term with sufficient precision to address the obviousness arguments”).

Here, the earlier finding that these terms are indefinite does not subvert Petitioner’s proposal of constructions sufficient to analyze validity under §§ 102 and 103, compliant with 37 C.F.R. § 42.104(b)(3), because the specification’s

disclosure is of commensurate detail with that in the prior art and provides sufficient precision for the Board to address the obviousness argument.

Accordingly, consistent with Patent Owner's representations before the district court in earlier litigation, Petitioner adopts the following proposed constructions for the purposes of this proceeding.

CLAIM	TERM	CONSTRUCTION
[9g] and [26e]	"a module for, if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling, thereby preventing packet discarding and loss by the queuing device"	(PO's Position) Plain and ordinary meaning <i>Alternatively—</i> (Partially Adopted by the WDTX)¹ Subject to 35 U.S.C. § 112, ¶ 6

¹ This proposed construction comports with the Court's adoption of the function and structure, and comports with Patent Owner's contention that this term has no special meaning by acknowledging that no algorithm is necessary because this is the function of a generic processor.

		Function: if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling Structure: a processor Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming. Ex. 1012, 16-17.
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B. Additional Means-Plus-Function Constructions Adopted in Prior Litigation

Several additional limitations of the '973 patent recite a “module,” and the district court in *WSOU Investments LLC D/B/A Brazos Licensing and Dev., v.*

Huawei Technologies Co., LTD., 6-20-cv-00538, Dkt. 61 (W.D. Tex. Jun. 17, 2020) interpreted these as means-plus-functions under 35 U.S.C. 112 ¶6. For the purpose of this proceeding, Petitioner adopts the following constructions determined in the prior case. Ex. 1012.

CLAIM	TERM	CONSTRUCTION
[9h] (similar limitation in [26f])	“a module for sending a message reporting the depth of the queue to the upstream device to thereby enable the upstream device to determine whether to reduce or increase the rate at which the upstream device sends packets to the queuing device”	(Adopted by the WDTX) Subject to 35 U.S.C. § 112, ¶ 6 Function: sending a message reporting the depth of the queue to the upstream device Structure: a processor Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming.

		Ex. 1012, 17.
[9i] (similar limitation in [26g])	“a module for sending the message from the e stream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device”	(Adopted by the WDTX) Subject to 35 U.S.C. § 112, ¶ 6 Function: sending the message from the upstream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device Structure: a processor Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming.

		Ex. 1012, 15.
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C. Additional Possible Means-Plus-Function Terms Not Construed in Prior Litigation

Although not construed or proposed for construction in the earlier litigation, the term “a module for monitoring a depth of a queue” arguably could be subject to construction under § 112, ¶6. Because this term was not construed in earlier litigation, the Patent Owner acquiesced to interpretation according to its plain and ordinary meaning. However, to the extent this term requires means plus function construction, for the purpose of this proceeding, Petitioner adopts the following construction consistent with the court’s construction of similar terms.

CLAIM	TERM	CONSTRUCTION
[9c] (similar limitation in [26c])	“a module for monitoring a depth of a queue”	Plain and ordinary meaning <i>Alternatively—</i> Subject to 35 U.S.C. § 112, ¶ 6 Function: monitoring a depth of a queue

		Structure: a processor Algorithm: N/A because “monitoring” is a function a general-purpose processor can do without requiring special programming.
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IV. GROUNDS: CLAIMS 1-31 ARE UNPATENTABLE

A. Grounds 1a and 1b: *Ma* alone (Ground 1a) and *Ma* in view of *Kim* (Ground 1b) Renders Obvious Claims 1, 2, 4-10, 12-16, 18-20, 22--27, and 29-31

1. Claim 1

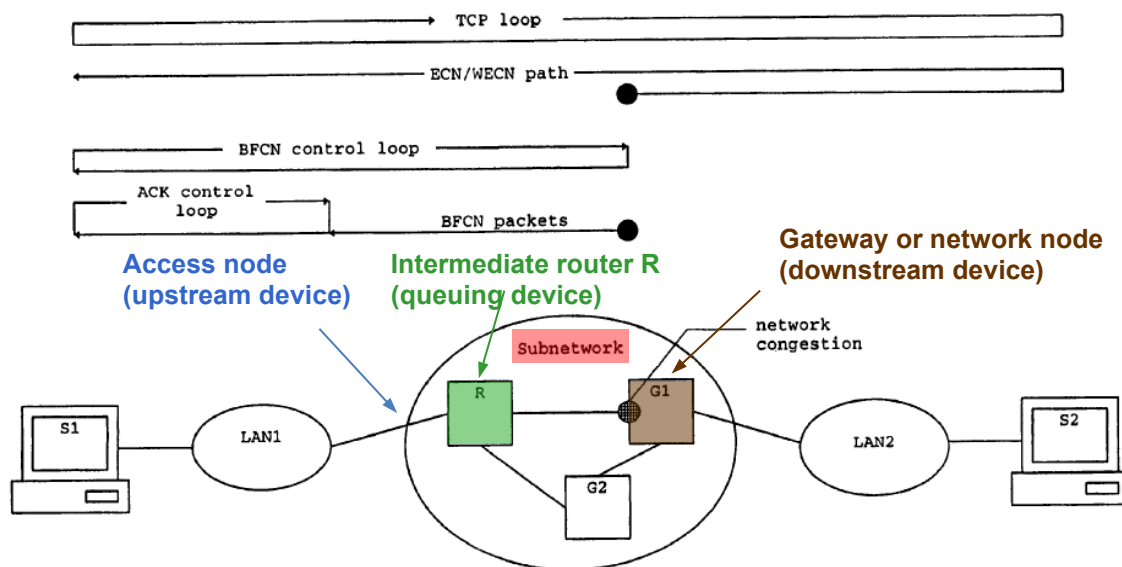
- a. [1Preamble]: “A method for incorporating a queuing device as a lossless processing stage in a network device in a communications network between an upstream device and a downstream device in the network device, comprising:”**

Ma discloses [1Preamble] because *Ma* discloses a method for incorporating an intermediate router R (“queuing device”) as a lossless processing stage in an IP subnetwork (“network device”) in a communications network between an edge device, such as an access node (“upstream device”), and a gateway (“downstream device”) in the IP subnetwork. Ex. 1003, ¶ 45.

Ma recognized the problem of packet loss in a communication network, stating, “packet losses result in a significant degradation in TCP throughput.” Ex.

1005, 1:40-42. *Ma* provides a solution to this problem by introducing “a method and network for controlling congestion in a packet-switched network” in which a “[burst] of source traffic can be constrained and unnecessary packet losses can be avoided already at an intermediate access node and within the network.” *Id.*, Abstract; Ex. 1003, ¶ 46.

Ma’s FIG. 1 shows a network configuration where “TCP sources S1 and S2 are connected via respective local area networks LAN1 and LAN2 to an IP subnetwork comprising network nodes such as an intermediate router R and gateways G1 and G2, through which data packets are transmitted in the IP subnetwork. Each of the local area networks LAN1 and LAN2 is connected to the subnetwork via a respective edge device, e.g. access node (not shown).” Ex. 1005, 6:50-57; Ex. 1003, ¶ 47.



Ex. 1005, FIG. 1 (annotated).

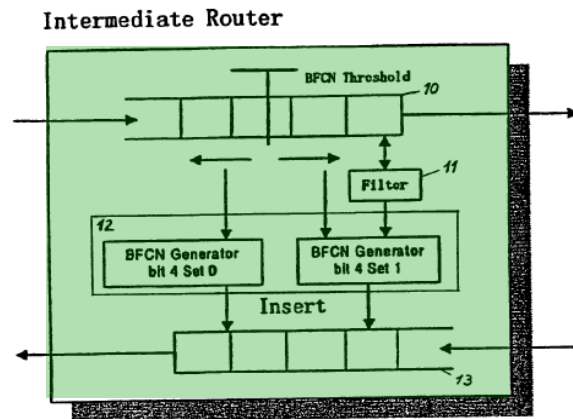
Ma discloses that “a packet queue length in a network node is determined and a congestion notification is transmitted back towards the source address of an incoming data packet received at the network node, if the detected packet queue length exceeds a predetermined threshold. Then, congestion control is performed at a predetermined intermediate network node in response to the receipt of the congestion notification.” Ex. 1005, Abstract; Ex. 1003, ¶ 48.

b. [1a]: “monitoring a depth of a queue in the queuing device,”

Ma discloses or renders obvious [1a] because *Ma* discloses monitoring a queue length (“depth of a queue”) in the intermediate router R (“queuing device”). Ex. 1003, ¶ 49.

Ma’s intermediate router R includes “a forward buffer 10, a backward buffer 13, a filter 11 and a congestion notification unit 12.” Ex. 1005, 7:48-52. “The congestion notification unit 12 comprises a mechanism for active queue management to detect incipient congestion in the forward buffer 10. For simplicity, only one FBCN threshold is set before the queue in the forward buffer 10 overflows. The congestion notification unit 12 **determines an average queue length** and compares this average queue length with the predetermined BFCN threshold. When the average queue length exceeds the BFCN threshold, an

incipient network congestion is determined. When the average queue length drops below the BFCN threshold, a release of the congestion in this intermediate node is determined.”² Ex. 1005, 7:53-63 (emphasis added); *see also id.*, 4:11-16, 5:3-6; Ex. 1003, ¶ 50.



Ex. 1005, FIG. 2 (annotated).

The '973 patent similarly discloses that “monitoring a depth of a queue in the queuing device, the queue for receiving packets from an upstream device within the network device, the queuing device acting as a discard point by discarding packets when the queue is full.” Ex. 1001, Abstract. Thus, the claimed “depth of a queue” is a fullness (or a level of filling) of the queue by packets. Just

² “BFCN” in the specification and the drawings appears to be a typographical error. The correct term is “FBCN” which is used throughout the specification when referring to the Fast Backward Congestion Notification.

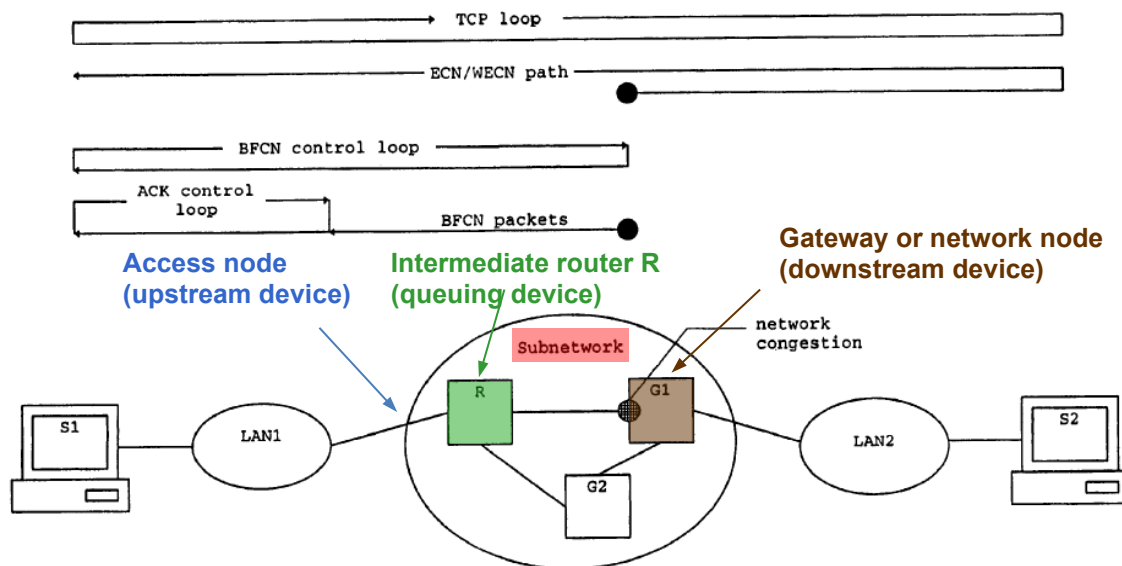
like the '973 patent, the packet queue length disclosed in *Ma* is a fullness (or a level of the filling) of a queue by packets. For example, *Ma* discloses that “congestion notification means **for determining a packet queue length in a buffer means**, and for generating a congestion notification and transmitting said congestion notification back towards the source address of an incoming data packet received at said network node, if the detected packet queue length exceeds a predetermined threshold.” Ex. 1005, 4:21-28 (emphasis added). Thus, the packet queue length of *Ma* constitutes the claimed “depth of a queue” in the queuing device. Ex. 1003, ¶ 51.

c. [1b]: “wherein the queue receives packets from the upstream device within the network device, and”

Ma discloses [1b] because *Ma* discloses that the queue in the intermediate router R (“queuing device”) receives packets from an edge device such as an access node (“upstream device”) within the subnetwork (“network device”). Ex. 1003, ¶ 52.

Ma discloses that “TCP sources S1 and S2 are connected via respective local area networks LAN1 and LAN2 to an IP subnetwork comprising network nodes such as an intermediate router R and gateways G1 and G2, through which data packets are transmitted in the IP subnetwork. Each of the local area networks LAN1 and LAN2 is connected to the subnetwork via a respective [edge device](#), e.g.

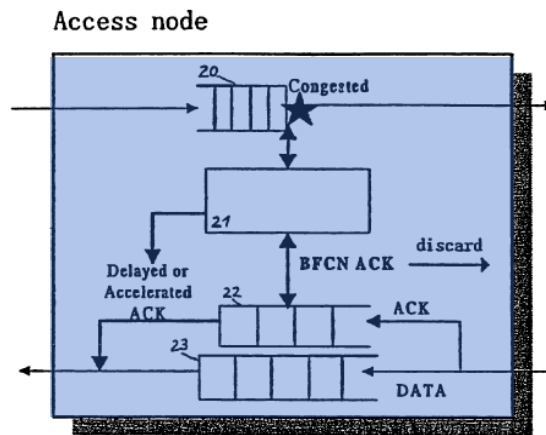
access node (not shown).” *Id.*, 6:50-57 (emphasis added). Because the packets are transmitted from the TCP source S1 to the subnetwork via LAN1, and the LAN1 is connected to the subnetwork via the access node, the access node is a device within the subnetwork and the queue of the intermediate router R receives packets from the access node. Ex. 1003, ¶ 53.



Ex. 1005, FIG. 1 (annotated).

Ma also discloses the structure of the access node. As shown in FIG. 3 below, *Ma*'s access node includes “a forward buffer 20 for **storing data packets to be transmitted in the forward direction**, a backward acknowledgement buffer 22 for storing extracted acknowledgement packets received from the IP network, a backward data buffer 23 for storing data packets received from the IP network, and a congestion control unit 21 for performing congestion control based on a detection

of an FBCN packet (i.e. FBCN ACK) received from the IP network or based on a detection of a congestion at the forward buffer 20.” Ex. 1005, 10:8-17; Ex. 1003, ¶ 54.



Ex. 1005, FIG. 3 (annotated).

The '973 patent similarly discloses that “[t]he upstream device may be another queuing device.” Ex. 1001, 3:21-22. Just like the '973 patent, as discussed above, the access node in *Ma* is another queuing device that stores data packets to be transmitted in the forward direction to the intermediate router R. Thus, the access node of *Ma* constitutes the claimed “upstream device” from which the intermediate router R receives packets. Ex. 1003, ¶ 55.

d. [1c]: “the queuing device acts as a discard point by discarding packets when the queue is full,”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [1c]. Ex. 1003, ¶ 56.

As explained for [1a] (Section IV.A.1.b), *Ma*'s intermediate router R ("queuing device") determines whether the queue is full by monitoring the queue length. It would have been obvious to a POSITA that *Ma*'s intermediate router R further acts as a discard point by discarding packets when the queue is full, because that is one of the two obvious choices that the intermediate router R can do—sending back the packets to the access node or discard the packets. Ex. 1003, ¶ 57.

For **Ground 1b**, to the extent Patent Owner argues that *Ma* does not explicitly disclose that the queuing device acts as a discard point by discarding packets when the queue is full, *Kim* does. Ex. 1003, ¶ 58.

Kim discloses that "[t]ypical stream control methods include: 1. Tail-drop: a method in which **packets coming in late are discarded when a full queue** or overflow occurs." Ex. 1006, [0010]-[0011]. *Kim* also discloses that "[i]f the received packet is an exception packet (S3), a flow_control flag set by the token driver 210 of the host processor 200 is checked to determine whether to enqueue or discard the received packet (S4)." *Id.*, [0087]; Ex. 1003, ¶ 59.

A POSITA would have been motivated to implement *Kim*'s method of discarding packets when the queue is full because discarding packets from a full queue was a routine feature of network devices. A POSITA would also have been motivated to implement *Kim*'s packet dropping within *Ma*'s system to provide additional ways to alleviate congestion. *Ma* is directed to detecting and alleviating

traffic congestion. Additionally dropping packets would have provided an additional way to alleviate congestion in the network, and a POSITA would have been motivated to use packet dropping to improve *Ma* at least in circumstances where rerouting traffic is insufficient to alleviate the congestion. *See* Ex. 1005, Fig. 4 (step 106); Ex. 1003, ¶ 60.

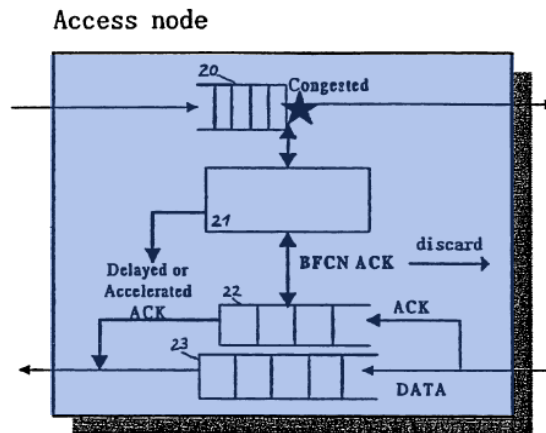
A POSITA would have had a reasonable expectation of success in implementing packet dropping, as taught by *Kim*, in *Ma*'s system because packet dropping was a commonly used technique that would have required only routine skill to implement. Ex. 1009, 31:25-63, 70:20-25 (filed in 1999, and describing a method for packet dropping in wireless communication systems); Ex. 1010, 20:17-30 (also filed in 1999, and describing packet dropping); Ex. 1011, 4:2-14, claim 2 (filed in 2003, and describing packet dropping); Ex. 1003, ¶ 61.

e. [1d]: “wherein the upstream device is a traffic manager;”

Ma discloses [1d] because *Ma* discloses that the access node (“upstream device”) that manages packet transmission between the intermediate router R and the TCP sources S1 also performs congestion control of the packet transmission. Ex. 1003, ¶ 62.

Ma's access node includes “a forward buffer 20 for storing data packets to be transmitted in the forward direction, a backward acknowledgement buffer 22 for

storing extracted acknowledgement packets received from the IP network, a backward data buffer 23 for storing data packets received from the IP network, and a **congestion control unit 21 for performing congestion control** based on a detection of an FBCN packet (i.e. FBCN ACK) received from the IP network or based on a detection of a congestion at the forward buffer 20.” Ex. 1005, 10:6-17; Ex. 1003, ¶ 63.



Ex. 1005, FIG. 3 (annotated).

Ma also discloses that “the congestion control mechanism according to the preferred embodiment of the present invention will be called Fast Backward Congestion Notification (FBCN). As can be gathered from FIG. 1, the BFCN control loop ranges from the network node at which the network congestion is detected to the source of the respective data packet. However, BFCN packets are only transmitted to the access node, where a congestion control based on an acknowledgment (ACK) control loop is initialized in response to the receipt of a

BFCN packet. Thus, flow-control time in the IP network is reduced by the BFCN mechanism.” Ex. 1005, 7:25-35; Ex. 1003, ¶ 64.

The ’973 patent discloses that a traffic manager is equivalent to, for example, a queuing device or a network processor. *See* Ex. 1001, 3:22-23, 3:28-31, 4:17-21. A POSITA would have understood that an access node is a traffic manager because like the traffic manager in the ’973 patent, the access node is optimized to support implementation of network protocols. Ex. 1003, ¶ 65.

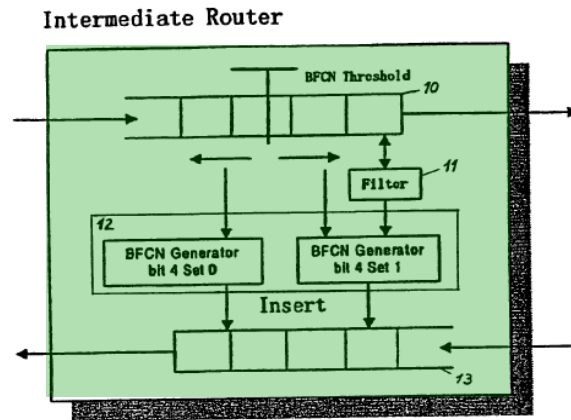
- f. [1e]: “if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling, thereby preventing packet discarding and loss by the queuing device;”

Ma discloses or renders obvious [1e] because *Ma* discloses that if the packet queue length (“depth of the queue”) exceeds a predetermined threshold, sending a congestion notification message (“message”) to the access node (“upstream device”) to reduce a rate at which packets are sent to the intermediate router R (“queuing device”) to prevent the queue from filling, thereby preventing packet discarding and loss by the intermediate router R. Ex. 1003, ¶ 66.

Ma’s intermediate router R determines whether the packet queue length passes a predetermined threshold. *Ma*’s intermediate router R includes a “congestion notification unit 12 [that] determines an average queue length and

compares this average queue length with the predetermined BFCN threshold.

When the average queue length exceeds the BFCN threshold, an incipient network congestion is determined.” Ex. 1005, 7:48-63 (emphasis added); Ex. 1003, ¶ 67.



Ex. 1005, FIG. 2 (annotated).

Ma's congestion notification unit 12 also sends a congestion notification message to the access node if the packet queue length exceeds a predetermined threshold. For example, *Ma* discloses that "[w]henver the buffer length in the network node exceeds or remains higher than the FBCN threshold, one **FBCN [Fast Backward Congestion Notification] packet** is generated by the congestion notification unit 12 for each forward incoming packet or, alternatively, only for one FBCN packet upon the reach of the FBCN threshold, wherein an FBCN bit is set in the FBCN packet." Ex. 1005, 7:64-8:2 (emphasis added); Ex. 1003, ¶ 68.

Ma also discloses how the congestion notification message is sent to the access node, explaining that "[w]hen the average queue length in the forward

buffer 10 exceeds the FBCN threshold, the FBCN packet is generated by latching the source and destination IP address of the incoming packets, setting or resetting the FBCN bit in the IP header, exchanging source and destination addresses in the generated FBCN packet in which the IP header is replicated from the forward passing packet. Then, the FBCN packet is inserted into the reverse direction stream of the backward buffer 13. Since the new destination address is equal to the source address of the forward packet, the FBCN packet can be returned towards the TCP source and passed through the respective access node of the IP network.” Ex. 1005, 9:31-42; Ex. 1003, ¶ 69.

Upon receipt of the congestion notification message, *Ma*’s access node starts congestion control. For example, *Ma* disclosed that “[a]fter the congestion notification message has been received at the access node between the LAN1 and the subnetwork, a congestion control is started at the access node and the congestion notification message is discarded.” Ex. 1005, 7:9-13; Ex. 1003, ¶ 70.

Ma also discloses that “in the adaptive congestion control according to the preferred embodiment, which is performed at the access node, the TCP source may automatically start to **slow down its transmission rate**, or at least it does not increase its transmission rate as fast as it otherwise would do, since the delay introduced at the access node slows down the rate at which the TCP source

increases the size of its congestion window.” Ex. 1005, 12:60-67 (emphasis added); Ex. 1003, ¶ 71.

Ma further discloses that “a congestion notification is transmitted back towards the source address of an incoming data packet received at the network node, if the detected packet queue length exceeds a predetermined threshold. Then, congestion control is performed at a predetermined intermediate network node in response to the receipt of the congestion notification. Thereby, bursts of source traffic can be constrained and unnecessary **packet losses can be avoided** already at an intermediate access node and within the network. The congestion notification message generated due to an incipient congestion is immediately routed back according to its source address. As a result, control delay time is shortened, such that buffer size requirements and number of congestion notification messages are reduced.” Ex. 1005, Abstract (emphasis added); Ex. 1003, ¶ 72.

g. [1f]: “**sending a message reporting the depth of the queue to the upstream device to thereby enable the upstream device to determine whether to reduce or increase the rate at which the upstream device sends packets to the queuing device; and**”

Ma discloses or renders obvious [1f] because, as explained for [1e] (Section IV.A.1.f), *Ma* discloses sending a congestion notification message to the access node (“upstream device”) to thereby enable the access node to determine to reduce the rate at which the access node sends packets to the intermediate router R

(“queuing device”). In addition, *Ma* discloses sending a congestion notification message to the access node (“upstream device”) to thereby enable the access node to determine to increase the rate at which the access node sends packets to the intermediate router R (“queuing device”). Ex. 1003, ¶ 73.

Ma discloses that “[w]hen the average queue length drops below the BFCN threshold, a release of the congestion in this intermediate node is determined.” Ex. 1005, 7:61-63; Ex. 1003, ¶ 74.

Ma also explains how to indicate in the message that the queue length drops below the threshold. *Ma* discloses that “[t]he congestion notification may be sent in a data packet generated at the network node. This may be achieved by setting a predetermined bit in the header of the data packet. Moreover, **another predetermined bit of the header of the data** packet may be used to indicate that the **queue length has dropped below the predetermined threshold**. In case, the congestion control is performed in an IP network, the predetermined bit and the other predetermined bit may be bit No. 3 and bit No. 4 in the IPv4 TOS octet, respectively.” Ex. 1005, 5:7-15 (emphasis added); Ex. 1003, ¶ 75.

Thus, *Ma*’s congestion notification including a **predetermined bit of the header of the data packet to indicate that the queue length has dropped below the predetermined threshold** also constitutes the “message” claimed in [1f]. Ex. 1003, ¶ 76.

- h. [1g]: “sending the message from the upstream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device.”**

Ma discloses or renders obvious [1g] because *Ma* discloses sending acknowledgment (ACK) packet (“message”) from the access node (“upstream device”) to the TCP sources (“upstream network device”) to thereby control a rate at which the access node receives packets from the TCP sources. Ex. 1003, ¶ 77.

Ma discloses that “the congestion control mechanism according to the preferred embodiment of the present invention will be called Fast Backward Congestion Notification (FBCN). As can be gathered from FIG. 1, the BFCN control loop ranges from the network node at which the network congestion is detected to **the source of the respective data packet**. However, BFCN packets are only transmitted to the access node, where a congestion control based on an acknowledgment (ACK) control loop is initialized in response to the receipt of a BFCN packet. Thus, flow-control time in the IP network is reduced by the BFCN mechanism.” Ex. 1005, 7:25-35 (emphasis added); Ex. 1003, ¶ 78.

Ma explains, “[i]f it is determined in step S102 that bit No. 3 is set, i.e. the concerned ACK packet is an FBCN packet, the flow proceeds to step S108 and an initial processing module is activated. In the initial module, a detector of the congestion control unit 21 detects FBCN packets in the backward path besides

watching the queue length in the forward buffer 20 of the access node. Then, the **ACK rate control** in the access node is initiated and the FBCN packet is discarded in step S106. Thus, the FBCN packet does not reach the respective TCP source. Based on an acknowledgement rate determined in step S106, a slow down or speed up of the ACK flow towards the TCP sources is then performed in step S107.” Ex. 1005, 10:43-52 (emphasis added); Ex. 1003, ¶ 79.

Ma also discloses that “in the adaptive congestion control according to the preferred embodiment, which is performed at the access node, the **TCP source** may automatically start to slow down its transmission rate, or at least it does not increase its transmission rate as fast as it otherwise would do, since the delay introduced at the access node slows down the rate at which the TCP source increases the size of its congestion window. Unlike FTCP, the FBCN mechanism is arranged to control the **ACK output rate** according to FBCN congestion notifications generated from each node of the network. Therefore, it can not only limit congestion at the access node, but simultaneously avoid unnecessary packet losses in the network due to the fact that bursts of the source traffic are constrained according to the whole network buffer occupancies, not just that of the access node.” Ex. 1005, 12:60-13:7 (emphasis added); Ex. 1003, ¶ 80.

2. Claim 9

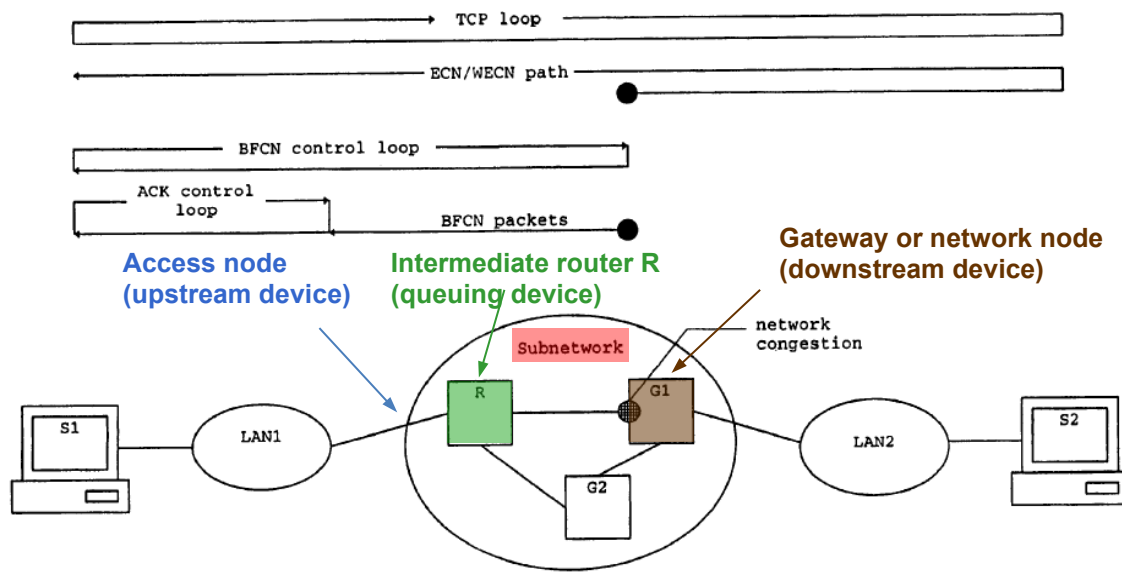
- a. [9Preamble]: “A system for incorporating a queuing device as a lossless processing stage in a network device in a communications network between an upstream device and a downstream device in the network device, the system comprising:”**

Ma discloses [9Preamble] because *Ma* discloses a method for incorporating an intermediate router R (“queuing device”) as a lossless processing stage in an IP subnetwork (“network device”) in a communications network between an edge device such as an access node (“upstream device”) and a gateway (“downstream device”) in the IP subnetwork. Ex. 1003, ¶ 81.

Ma recognized the problem of packet loss in communication networks. For example, *Ma* discloses that “packet losses result in a significant degradation in TCP throughput.” Ex. 1005, 1:41-42. *Ma* provided a solution to the problem by introducing “a method and network for controlling congestion in a packet-switched network” in which “[bursts] of source traffic can be constrained and unnecessary packet losses can be avoided already at an intermediate access node and within the network.” *Id.*, Abstract; Ex. 1003, ¶ 82.

As shown in annotated FIG. 1 below, *Ma* discloses a network configuration in which “TCP sources S1 and S2 are connected via respective local area networks LAN1 and LAN2 to an **IP subnetwork** comprising network nodes such as an **intermediate router R** and **gateways G1** and G2, through which data packets are

transmitted in the IP subnetwork. Each of the local area networks LAN1 and LAN2 is connected to the subnetwork via a respective **edge device**, e.g. **access node** (not shown).” *Id.*, 6:50-57 (emphasis added); Ex. 1003, ¶ 83.



Ex. 1005, FIG. 1 (annotated).

Ma also discloses that “a packet queue length in a network node is determined and a congestion notification is transmitted back towards the source address of an incoming data packet received at the network node, if the detected packet queue length exceeds a predetermined threshold. Then, congestion control is performed at a predetermined intermediate network node in response to the receipt of the congestion notification.” Ex. 1005, Abstract; Ex. 1003, ¶ 84.

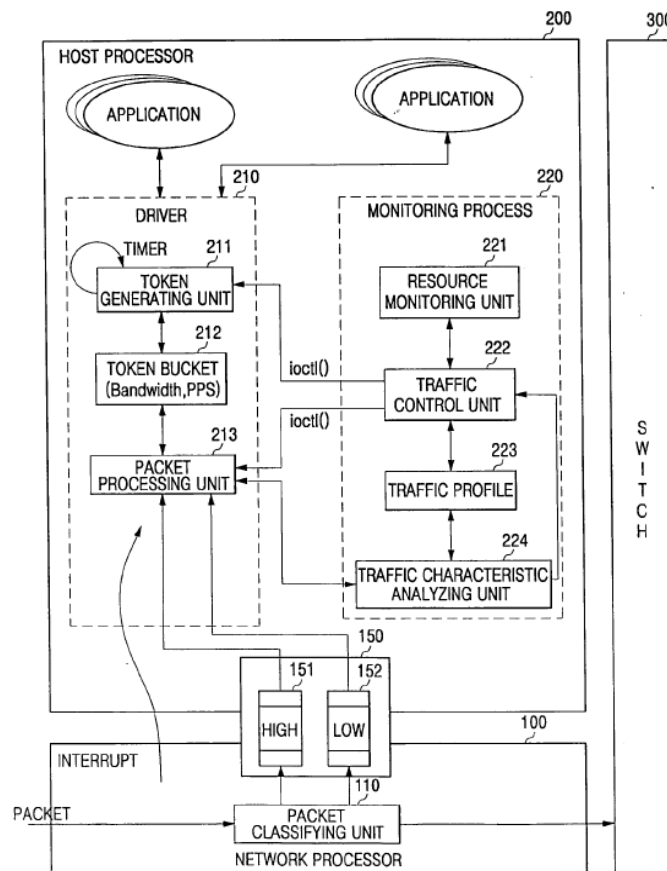
**b. [9a]: “a processor coupled to the queuing device;
and”**

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9a]. Ex. 1003, ¶ 85.

As discussed for [9preamble] (Section IV.A.2.a), *Ma* discloses determining a queue length (“depth of a queue”) in the intermediate router R (“queuing device”). While *Ma*’s disclosure is more directed to its method than the specific hardware for performing the method, a POSITA would have understood that *Ma*’s system included routine hardware components like a processor for performing its method. A POSITA would have understood that *Ma*’s system includes a processor coupled to a queuing device because monitoring the queue depth and instructing the system to act accordingly are steps that a POSITA would have understood to be performed by a processor. Ex. 1003, ¶ 86.

For **Ground 1b**, to the extent Patent Owner argues that *Ma* does not explicitly disclose a processor coupled to a queuing device, *Kim* does. Ex. 1003, ¶ 87.

As shown in FIG. 1 below, *Kim* discloses that “[w]hen the packet is being received in the host processor 200 according the above described process, the host processor 200 processes the received packet according to a series of algorithms, and the process is as follows.” Ex. 1006, [0094]; Ex. 1003, ¶ 88.



Ex. 1006, FIG. 1

Because *Ma*'s system performs steps that would be understood by a POSITA to be performed by a processor, a POSITA would have been motivated to look to references—like *Kim*—that disclose similar methodology using a processor. And, because the processor is used for its conventional and routine purpose, a POSITA would have reasonably expected success in implementing a processor in *Ma*. Ex. 1003, ¶ 89.

c. [9b]: “modules executed by the processor, the modules including:”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9b]. Ex. 1003, ¶ 90.

As explained for [9a] (Section IV.A.2.b), a POSITA would have understood *Ma* to disclose a processor to perform its disclosed method. A POSITA would further have understood that processors necessarily operate by executing software instructions, or modules. Ex. 1003, ¶ 91.

For **Ground 1b**, to the extent Patent Owner argues that *Ma* does not explicitly disclose a processor executing software modules, *Kim* does. *Kim* discloses “[w]hen the packet is being received in the host processor 200 according the above described process, the host processor 200 processes the received packet according to a series of algorithms, and the process is as follows.” Ex. 1006, [0094]. A POSITA would have understood that the series of algorithms are software modules, as explained for each of the following sections. Ex. 1003, ¶ 92.

Because *Ma*’s system performs steps that would be understood by a POSITA to be performed by a processor executing software modules, a POSITA would have been motivated to look to references—like *Kim*—that disclose similar methodology using a processor executing software modules. And, because the processor is used for its conventional and routine purpose (performing steps coded

into the software being executed), a POSITA would have reasonably expected success in implementing a processor in *Ma*. Ex. 1003, ¶ 93.

d. [9c]: “a module for monitoring a depth of a queue in the queuing device,”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9c] as explained for [1a] (Section IV.A.1.b). Ex. 1003, ¶ 94.

To the extent this limitation is interpreted under 35 U.S.C. § 112, ¶ 6, the following construction should apply:

Function: monitoring a depth of a queue

Structure: a processor

Algorithm: N/A because “monitoring” is a function a general-purpose processor can do without requiring special programming. Ex. 1003, ¶ 95

In this instance, *Ma* alone or in combination with *Kim* renders obvious the function as explained for [1a] (Section IV.A.1.b) and the structure as explained for [9a] (Section IV.A.2.b). Ex. 1003, ¶ 96.

e. [9d]: “wherein the queue receives packets from the upstream device within the network device and”

Ma discloses or renders obvious [9d] as explained for [1b] (Section IV.A.1.c). Ex. 1003, ¶ 97.

- f. [9e]: “the queuing device acts as a discard point by discarding packets when the queue is full,”**

Ma alone (Ground 1A) or in combination with *Kim* renders obvious [9e] as explained for [1c] (Section IV.A.1.d). Ex. 1003, ¶ 98.

- g. [9f]: “wherein the upstream device is a traffic manager;”**

Ma discloses or renders obvious [9f] as explained for [1d] (Section IV.A.1.e). Ex. 1003, ¶ 99.

- h. [9g]: “a module for, if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling, thereby preventing packet discarding and loss by the queuing device;”**

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9g] as explained for [1e] (Section IV.A.1.f). Ex. 1003, ¶ 100.

To the extent this limitation is interpreted under 35 U.S.C. § 112, ¶ 6, the following construction should apply:

Function: if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling

Structure: a processor

Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming. Ex. 1012, 16-17; Ex. 1003, ¶ 101.

In this instance, *Ma* alone or in combination with *Kim* renders obvious the function as explained for [1e] (Section IV.A.1.f) and the structure as explained for [9a] (Section IV.A.2.b). Ex. 1003, ¶ 102.

- i. [9h]: “a module for sending a message reporting the depth of the queue to the upstream device to thereby enable the upstream device to determine whether to reduce or increase the rate at which the upstream device sends packets to the queuing device; and”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9h] as explained for [1f] (Section IV.A.1.g). Ex. 1003, ¶ 103.

To the extent this limitation is interpreted under 35 U.S.C. § 112, ¶ 6, the following construction should apply:

Function: sending a message reporting the depth of the queue to the upstream device

Structure: a processor

Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming. Ex. 1012, 17; Ex. 1003, ¶ 104.

In this instance, *Ma* alone or in combination with *Kim* renders obvious the function as explained for [1f] (Section IV.A.1.g) and the structure as explained for [9a] (Section IV.A.2.b). Ex. 1003, ¶ 105.

- j. **[9i]: “a module for sending the message from the e stream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device.”**

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [9i] as explained for [1g] (Section IV.A.1.h). Ex. 1003, ¶ 106.

To the extent this limitation is interpreted under 35 U.S.C. § 112, ¶ 6, the following construction should apply:

Function: sending the message from the upstream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device

Structure: a processor

Algorithm: N/A because pursuant to “sending” is a function a general-purpose processor can do without requiring special programming. Ex. 1012, 15; Ex. 1003, ¶ 17.

In this instance, *Ma* alone or in combination with *Kim* renders obvious the function as explained for [1g] (Section IV.A.1.h) and the structure as explained for [9a] (Section IV.A.2.b). Ex. 1003, ¶ 108.

3. Claim 19

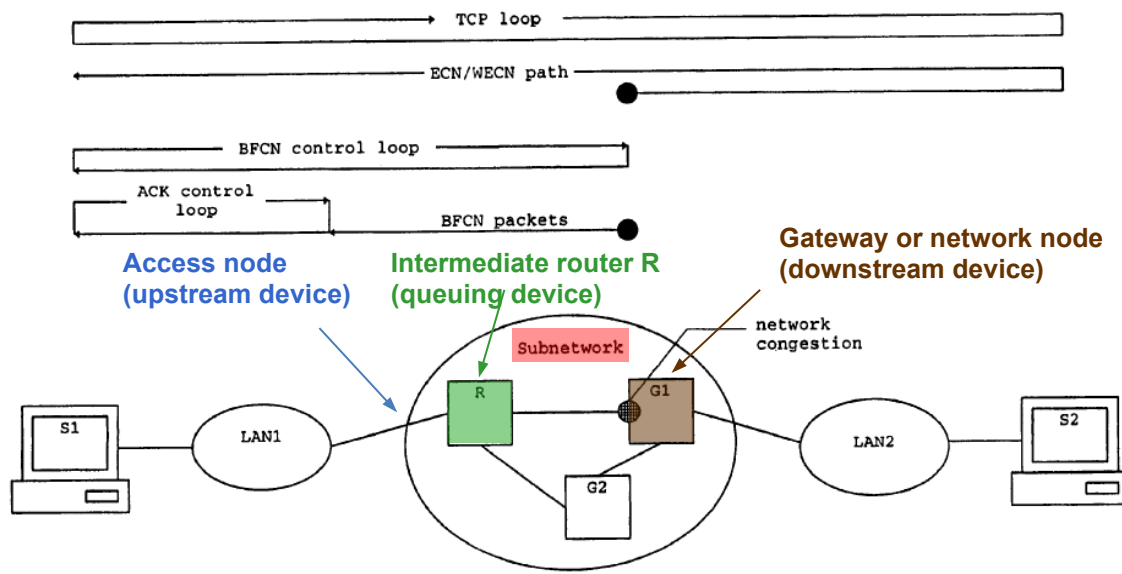
- a. **[19Preamble]: “A method for incorporating an integrated queuing and packet processing device as a lossless processing stage in a network device in a communications network between an upstream device and a downstream device in the network device, the method comprising:”**

Ma discloses [1Preamble] because *Ma* discloses method for incorporating an intermediate router R (“queuing device”) as a lossless processing stage in an IP subnetwork (“network device”) in a communications network between an edge device such as an access node (“upstream device”) and a gateway (“downstream device”) in the IP subnetwork. Ex. 1003, ¶ 109.

Ma recognized the problem of packet loss in communication network. For example, *Ma* discloses that “packet losses result in a significant degradation in TCP throughput.” Ex. 1005, 1:41-42. *Ma* provided a solution to the problem by introducing “a method and network for controlling congestion in a packet-switched network” in which “[bursts] of source traffic can be constrained and unnecessary packet losses can be avoided already at an intermediate access node and within the network.” *Id.*, Abstract; Ex. 1003, ¶ 110.

As shown in annotated FIG. 1 below, *Ma* discloses a network configuration in which “TCP sources S1 and S2 are connected via respective local area networks LAN1 and LAN2 to an **IP subnetwork** comprising network nodes such as an **intermediate router R** and **gateways G1** and G2, through which data packets are

transmitted in the IP subnetwork. Each of the local area networks LAN1 and LAN2 is connected to the subnetwork via a respective **edge device**, e.g. **access node** (not shown).” Ex. 1005, 6:50-57 (emphasis added); Ex. 1003, ¶ 111.



Ex. 1005, FIG. 1 (annotated).

Ma also discloses that “a packet queue length in a network node is determined and a congestion notification is transmitted back towards the source address of an incoming data packet received at the network node, if the detected packet queue length exceeds a predetermined threshold. Then, congestion control is performed at a predetermined intermediate network node in response to the receipt of the congestion notification.” Ex. 1005, Abstract; Ex. 1003, ¶ 112.

b. [19a]: “monitoring a depth of a queue in the integrated device,”

Ma discloses or renders obvious [19a] as explained for [1a] (Section IV.A.1.b). Ex. 1003, ¶ 113.

c. [19b]: “wherein the queue receives packets from the upstream device within the network device,”

Ma discloses or renders obvious [19b] as explained for [1b] (Section IV.A.1.c). Ex. 1003, ¶ 114.

d. [19c]: “the packets from the upstream device include packets having different priorities arbitrated by the upstream device, and”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [19c]. Ex. 1003, ¶ 115.

As explained for [1b] (Section IV.A.1.c), *Ma*’s intermediate router R (“queuing device”) receives packets from an access node (“upstream device”). It would have been obvious to a POSITA that the packets from the access node would have had different priorities arbitrated by the access node because prioritizing packets was well known. *See* Ex. 1014, 1:63-2:7 (filed in 2005 and describing prioritizing packets); Ex. 1015, Abstract (filed in 2002 and describing managing data flow that considers priority of traffic). Moreover, *Ma* contemplates that the FBCN packets have a higher priority than the ENC or WECN packets. Ex. 1005, 10:60-66; Ex. 1003, ¶ 116.

For **Ground 1b**, to the extent Patent Owner argues *Ma* does not explicitly disclose that the packets from the upstream device have different priorities arbitrated by the upstream device, *Kim* does. Ex. 1003, ¶ 117.

Kim discloses that “[t]he packet classifying unit is adapted to classify the packets to be forwarded to a switch and the packets to be forwarded to the first and second host processors in accordance with a header of the packets received by the network processor. The queue comprises a variable length queue adapted to enqueue a packet having a high priority into a high queue and to enqueue a packet having a low priority into a low queue.” Ex. 1006, [0031]-[0032]; Ex. 1003, ¶ 118.

Kim also discloses that “[c]hecking the flag and transmitting the packet comprises: discriminating a flag value which indicates whether or not the receiving processor can receive a packet upon a packet to be forwarded to the receiving processor being generated by the network processor; discarding the packet when the flag value is set to a value indicating that the receiving processor is incapable of receiving the packet; comparing a priority of the packet when the flag value is set to a value indicating that the receiving processor is capable of receiving the packet; enqueueing the packet in a corresponding priority queue in accordance with the priority of the packet; and transmitting an interrupt signal to the receiving processor after enqueueing.” Ex. 1006 at [0036]; Ex. 1003, ¶ 119.

Ma suggests having packets with different priorities. But *Ma* does not provide additional details about how packet priorities are arbitrated. A POSITA analyzing *Ma*'s system would, therefore, have looked to other references to supply the methodology for arbitrating packet priority—like *Kim*. Prioritizing packets was a well-known and routine function of packet management and transmission systems. *See* Ex. 1014, 1:63-2:7 (filed in 2005 and describing prioritizing packets); Ex. 1015, Abstract (filed in 2002 and describing managing data flow that considers priority of traffic). And a POSITA would have reasonably expected success in implementing *Kim*'s prioritization procedure in *Ma* to achieve the expected result as already suggested by *Ma*. Ex. 1003, ¶ 120.

e. [19d]: “the integrated device acts as a discard point by discarding packets when the queue is full,”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) discloses or renders obvious [19d] as explained for [1c] (Section IV.A.1.d). Ex. 1003, ¶ 121.

f. [19e]: “wherein the upstream device is a traffic manager;”

Ma discloses or renders obvious [19e] as explained for [1d] (Section IV.A.1.e). Ex. 1003, ¶ 122.

g. [19f]: “if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the integrated device to prevent the queue

from filling and thereby preventing packet discarding and loss by the integrated device,”

Ma discloses or renders obvious [19f] as explained for [1e] (Section IV.A.1.f). Ex. 1003, ¶ 123.

h. [19g]: “wherein a rate at which data is sent to the integrated device differs from a rate at which data is sent from the integrated device due to packet processing within the integrated device;”

Ma discloses or renders obvious [19g] because *Ma* discloses receiving packets (data sent to the integrated device) at a particular rate, processing those packets by determining the type of packet and congestion along the path, and sending packets (data sent from the integrated device) at a different rate based on ACK rate control. Ex. 1003, ¶ 124.

Ma explains that in response to each “congestion notification received from the packet-switched network,” which a POSITA would have understood to be received at a particular rate, congestion control is performed by “controlling the rate of acknowledgments routed through the intermediate network node” by selecting a new acknowledgment rate including “a delay time” calculated “in response to each arrival of the congestion notification.” Ex. 1005, 5:36-6:22; Ex. 1003, ¶ 125.

With reference to FIG. 4, *Ma* further discloses that “an ACK identification is performed in step S100 so as to extract ACK packets from the packet flow received

from the IP network.” Ex. 1005, 10:27-32. A POSITA would have understood these packets to be received at a particular rate because in wireless communication systems like *Ma* packets are transmitted at a given rate. Once the ACK packets are received and extracted, *Ma* discloses processing these received packets by performing congestion detection and determining the type of packet (FBCN, ECN, or WECN). *Id.*, 10:33-52. As a result of this processing, if the ACK packet is an FBCN packet, “an initial processing module is activated” to detect congestion, and “the ACK rate control in the access node is initiated” to either drop or adjust the acknowledgment rate. *Id.*, 10:43-52. Based on the determined acknowledgment rate, “a slow down or speed up of the ACK flow toward the TCP sources is then performed,” thus transmitting outgoing packets at a new rate, different from the received rate. *Id.*, 10:53-55; *see also id.*, 10:56-11:7 11:8-44; Ex. 1003, ¶ 126.

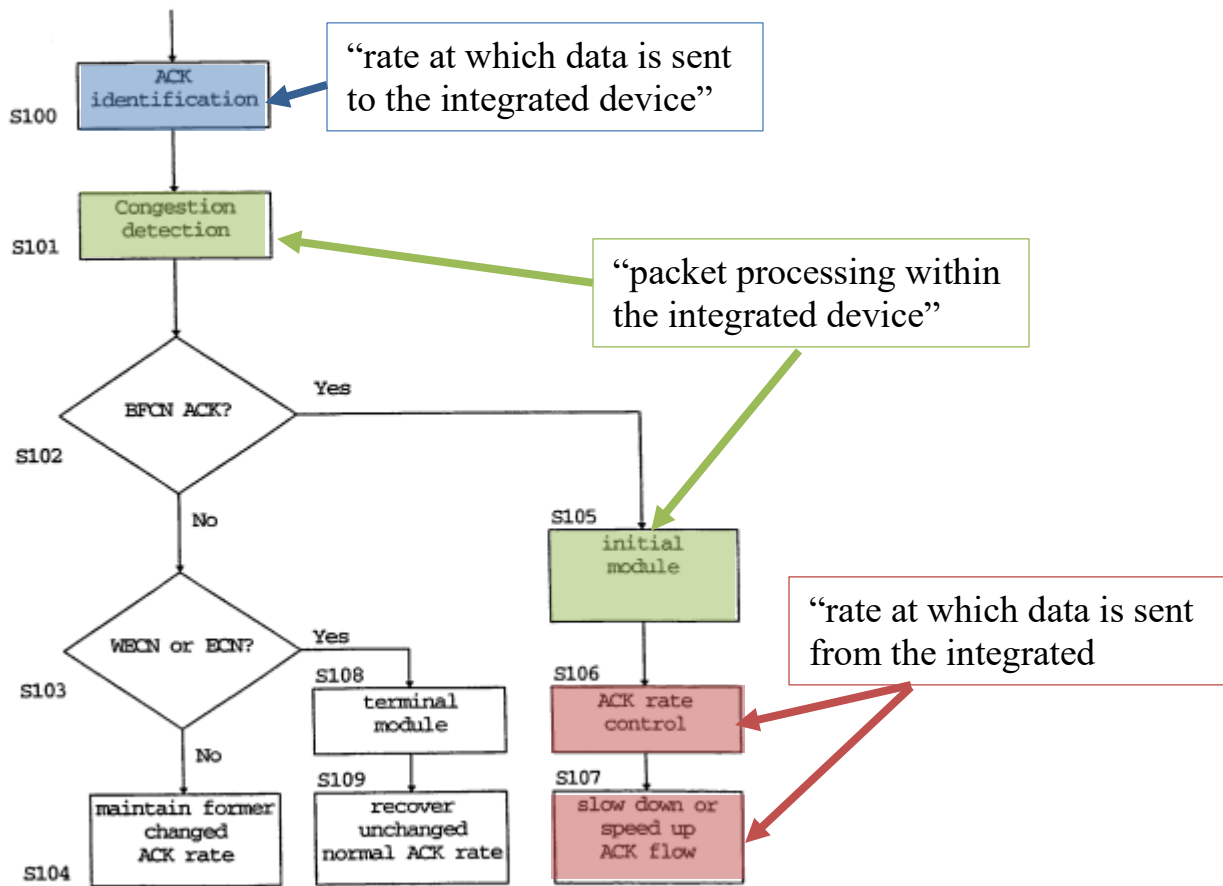


Fig. 4

Ma, FIG. 4 (annotated).

- i. [19h]: “sending a message reporting the depth of the queue to the upstream device to thereby enable the upstream device to determine whether to reduce or increase the rate at which the upstream device sends packets to the integrated device; and”

Ma discloses or renders obvious [19h] as explained for [1f] (Section IV.A.1.g). Ex. 1003, ¶ 127.

- j. [19i]: “sending the message from the upstream device to an upstream network device to thereby control a

**rate at which the upstream device receives packets
from the upstream network device.”**

Ma discloses or renders obvious [19i] as explained for [1g] (Section IV.A.1.h). Ex. 1003, ¶ 128.

4. Claim 26

- a. [26Preamble]: “A queuing device for incorporation as a lossless processing stage in a network device in a communications network between an upstream device and a downstream device in the network device, the queuing device comprising:”**

Ma discloses or renders obvious [26Preamble] as explained for [9Preamble] (Section IV.A.2.a). Ex. 1003, ¶ 129.

- b. [26a]: “a processor coupled to a queue, wherein the queue receives packets from the upstream device within the network device; and”**

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26a] as explained for [9a] (Section IV.A.2.b) and [9d] (Section IV.A.2.e). Ex. 1003, ¶ 130.

- c. [26b]: “modules executed by the processor, the modules including:”**

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26b] as explained for [9b] (Section IV.A.2.c). Ex. 1003, ¶ 131.

d. [26c]: “a module for monitoring a depth of the queue,”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26c] as explained for [1a] (Section IV.A.1.b) and 9[c] (Section IV.A.2.d). Ex. 1003, ¶ 132.

e. [26d]: “the queuing device acting as a discard point by discarding packets when the queue is full;”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26d] as explained for [1c] (Section IV.A.1.d). Ex. 1003, ¶ 133.

f. [26e]: “a module for, if the depth of the queue passes a predetermined threshold, sending a message to the upstream device to reduce a rate at which packets are sent to the queuing device to prevent the queue from filling and thereby preventing packet discarding and loss by the queuing device, wherein the upstream device is a traffic manager;”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26e] as explained for [1d] (Section IV.A.1.e), [1e] (Section IV.A.1.f), [9f] (Section IV.A.2.g), and [9g] (Section IV.A.2.h). Ex. 1003, ¶ 134.

g. [26f]: “a module for sending a message reporting the depth of the queue to the upstream device to thereby enable the upstream device to determine whether to

reduce or increase the rate at which the upstream device sends packets to the queuing device; and”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious [26f] as explained for [1f] (Section IV.A.1.g) and [9h] (Section IV.A.2.i). Ex. 1003, ¶ 135.

h. [26g]: “a module for sending the message from the upstream device to an upstream network device to thereby control a rate at which the upstream device receives packets from the upstream network device.”

Ma alone (Ground 1a) or in combination with *Kim* (Ground 1b) renders obvious renders obvious [26g] as explained for [1g] (Section IV.A.1.h) and [9i] (Section IV.A.2.j). Ex. 1003, ¶ 136.

5. Claims 2, 10, 20, 27: “if the depth drops below the predetermined threshold: sending a message to the upstream device to increase the rate at which packets are sent to the queuing device.”

Claims 2, 10, 20, and 27 are identical aside from the independent claim from which they depend. *Ma* discloses or renders obvious these claims because *Ma* discloses that “if the depth drops below the predetermined threshold: sending a message to the upstream device to increase the rate at which packets are sent to the queuing device,” as claimed. Ex. 1003, ¶ 137.

Ma discloses that “[w]hen the average queue length drops below the BFCN threshold, a release of the congestion in this intermediate node is determined.” Ex. 1005, 7:61-63. *Ma* further discloses that “an FBCN packet with an FBCN bit

turned off is generated if the queue length drops below the FBCN threshold. When the queue length remains below the threshold, no additional FBCN packet is generated and no filter mechanism is employed. Since the FBCN packet with a set FBCN bit is produced once per round-trip time, if buffer congestion still exists, the generation of the FBCN packet with a FBCN bit turned off will not exceed once per round-trip time. For example, if the congestion lasts longer than a round-trip time, the FBCN packet with FBCN bit '0' will not be generated until the length of the queue returns back to the lower threshold level. Thereafter, no additional FBCN packet with reset FBCN bit is generated, since the queue remains lower than the threshold, such that the total number of FBCN packets with reset FBCN bit is less than the number of packets with set FBCN bit. On the other hand, if the node congestion is released before a round-trip time has passed, the number of FBCN packets with FBCN bit of '0' (reset) is equal to those with FBCN of '1' (set) in this node." *Id.* at 8:24-43; Ex. 1003, ¶ 138.

Ma also discloses that "[w]ith the above two different kinds of FBCN messages, the access node in which the adaptive congestion control is implemented will increase the acknowledgment rate if a FBCN packet with reset FBCN bit has been received, since this indicates that the congestion in the notifying network node has been released." Ex. 1005, 8:58-63; Ex. 1003, ¶ 139.

6. Claims 4, 12, 22, and 29: “wherein the network device is a router, switch, or gateway.”

Claims 4, 12, 22, and 29 are identical aside from the independent claim from which they depend. *Ma* discloses or renders obvious these claims because *Ma* discloses that “the network device is a router switch or gateway.” Ex. 1003, ¶ 140.

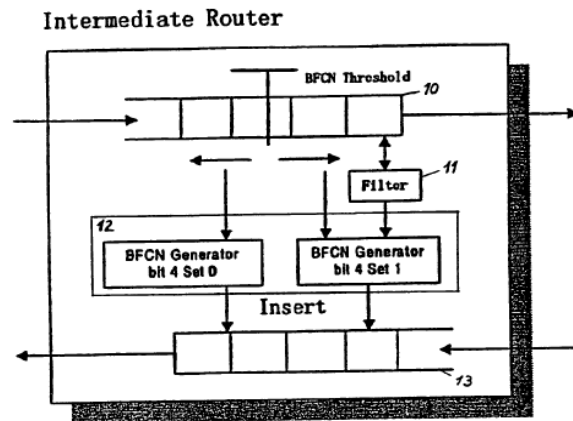
Ma discloses that “FIG. 1 shows a network configuration, wherein TCP sources S1 and S2 are connected via respective local area networks LAN1 and LAN2 to an IP subnetwork comprising **network nodes such as an intermediate router R and gateways G1 and G2**, through which data packets are transmitted in the IP subnetwork. Each of the local area networks LAN1 and LAN2 is connected to the subnetwork via a respective edge device, e.g. access node (not shown).” Ex. 1005, 6:50-57 (emphasis added); Ex. 1003, ¶ 141.

7. Claims 5, 13, 24, and 30: “wherein the queuing device is a network processor or traffic manager.”

Claims 5, 13, 24, and 30 are identical aside from the independent claim from which they depend. *Ma* discloses or renders obvious these claims because *Ma* discloses that “the queuing device is a network processor or traffic manager.” Ex. 1003, ¶ 142.

As discussed above, a POSITA would have understood intermediate router R to be a queuing device. *Ma* discloses that “FIG. 2 shows a functional block diagram of the intermediate router R, which comprises a forward buffer 10, a

backward buffer 13, a filter 11 and a congestion notification unit 12. The congestion notification unit 12 comprises a mechanism for active queue Management to detect incipient congestion in the forward buffer 10. For simplicity, only one FBCN threshold is set before the queue in the forward buffer 10 overflows. The congestion notification unit 12 determines an average queue length and compares this average queue length with the predetermined BFCN threshold. When the average queue length exceeds the BFCN threshold, an incipient network congestion is determined. When the average queue length drops below the BFCN threshold, a release of the congestion in this intermediate node is determined. Whenever the buffer length in the network node exceeds or remains higher than the FBCN threshold, one FBCN packet is generated by the congestion notification unit 12 for each forward incoming packet or, alternatively, only for one FBCN packet upon the reach of the FBCN threshold, wherein an FBCN bit is set in the FBCN packet.” Ex. 1005, 7:48-8:2. Thus, the intermediate router R is at least a traffic manager. Ex. 1003, ¶ 143.



Ex. 1005, FIG. 2

Ma also discloses that “[t]he FBCN mechanism guarantees that the congestion control is executed in a current round-trip time by quickly responding to previous FBCN messages in the same transmission window. Data transmission rate can be reduced and congestion can be alleviated before an amount of data corresponding to the transmission window has been received at the destination. This allows traffic to be kept under control using a limited number of FBCN messages. Moreover, since the FBCN mechanism requires only an IP indicator, an interface facility between IP and TCP can be avoided and there is no need for any changes in the response to the FBCN message at the receiver.” Ex. 1005 at 9:48-59. Thus, a POSITA would have understood that by managing congestion, the intermediate router R is also managing traffic. Ex. 1003, ¶ 144.

8. **Claims 6, 14, 25, and 31: “wherein the packets are at least one of Internet Protocol (“IP”) packets, multiprotocol label**

switching (“MPLS”) packets, asynchronous transfer mode (“ATM”) packets, and frame relay packets.

Claims 6, 14, 25, and 31 are identical aside from the independent claim from which they depend. *Ma* discloses or renders obvious these claims because *Ma* discloses that “the packets are at least one of Internet Protocol (“IP”) packets, multiprotocol label switching (“MPLS”) packets, asynchronous transfer mode (“ATM”) packets, and frame relay packets.” Ex. 1003, ¶ 145.

Ma discloses that “[w]hen the average queue length in the forward buffer 10 exceeds the FBCN threshold, the FBCN packet is generated by latching the source and destination **IP address** of the incoming packets, setting or resetting the FBCN bit in the **IP header**, exchanging source and destination addresses in the generated FBCN packet in which the IP header is replicated from the forward passing packet. Then, the FBCN packet is inserted into the reverse direction stream of the backward buffer 13. Since the new destination address is equal to the source address of the forward packet, the FBCN packet can be returned towards the TCP source and passed through the respective access node of the IP network.” Ex. 1005, 9:30-42 (emphasis added). Thus, a POSITA would have understood that the packets disclosed in *Ma* are at least IP packets. Ex. 1003, ¶ 146.

9. Claim 7: “The method of claim 1, further comprising, after the queue has been drained: alerting the upstream device to resume sending traffic to the queue.”

Ma discloses or renders obvious claim 7 because *Ma* discloses that “after the queue has been drained: alerting the upstream device to resume sending traffic to the queue.” Ex. 1003, ¶ 147.

For example, *Ma* discloses that “FIG. 2 shows a functional block diagram of the intermediate router R, which comprises a forward buffer 10, a backward buffer 13, a filter 11 and a congestion notification unit 12. The congestion notification unit 12 comprises a mechanism for active queue management to detect incipient congestion in the forward buffer 10. For simplicity, only one FBCN threshold is set before the queue in the forward buffer 10 overflows. The congestion notification unit 12 determines an average queue length and compares this average queue length with the predetermined BFCN threshold. When the average queue length exceeds the BFCN threshold, an incipient network congestion is determined. When the average queue length drops below the BFCN threshold, a release of the congestion in this intermediate node is determined.” Ex. 1005, 7:48-63. The ’973 patent recites that “[i]nstead of allowing the queuing device 140 to fill its queues and discard traffic packets, the queue depth monitoring system alerts an upstream device (e.g. 120 in FIG. 1) to slow down or stop sending traffic destined to the congested queue or queues in the queuing device 140. Once the queue has been

drained, the queue depth monitoring system can then alert the upstream device 120 to begin sending traffic to the queue again.” Ex. 1001, 5:55-62. In the context of the ’973 patent, a POSITA would have understood that the claimed “the queue has been drained” simply requires that the queue depth be low enough that it is ready to receive traffic once again. Ex. 1003, ¶ 148.

Ma further discloses that “[w]ith the above two different kinds of FBCN messages, the access node in which the adaptive congestion control is implemented will increase the acknowledgment rate if a FBCN packet with reset FBCN bit has been received, since this indicates that the congestion in the notifying network node has been released.” Ex. 1005, 8:58-63. A POSITA would have understood that a message with the reset FBCN alerts the upstream device, access node, to resume sending traffic to the queue. Ex. 1003, ¶ 149.

**10. Claim 8: “The method of claim 1, further comprising:
periodically reporting the depth of the queue to provide for
error recovery.”**

Ma discloses or renders obvious claim 8 because it discloses cyclically (“periodically”) reporting the congestion notification (“depth of the queue”) to provide for error recovery. Ex. 1003, ¶ 150.

The ’973 patent only mentions “error recovery” in one place in the specification, stating, “the queue depth monitoring system provides for error recovery in the event that it makes a mistake or that a message is lost or corrupted.

The queue depth monitoring system provides for error recovery by periodically reporting queue depths rather than only reporting threshold crossing events.” Ex. 1001, 6:3-8. This description provides no enabling disclosure of how periodic reporting provides for error recovery but assumes that periodically reporting queue depths rather than reporting only threshold crossing events *per se* achieves the goal of providing for error recovery. Ex. 1003, ¶ 151.

Although *Ma* does not expressly state that its cyclical reporting of congestion is for the purpose of error reporting, it meets this limitation because given the '973 patent's limited written description, for this claim to be valid as fully supported in the specification, a POSITA would have understood that periodic reporting rather than threshold reporting achieves the desired error recovery. Ex. 1003, ¶ 152.

Ma discloses that “[t]he processing order of the above schemes should be implemented in such a manner that the FBCN mechanism is initiated at first. Then, if the buffer size has reached the comparatively highest ECN threshold, the ECN mechanism starts. The WECN mechanism is initiated if a packet loss due to congestion occurs before ECN messages have been received from a data window. If ECN bit and WECN bit are both set in the IP header of a received packet, a higher priority may be allocated to WECN, since WECN indicates a heavier network congestion, and the source window reduction is initiated by WECN in this

case. The cycle of these procedures is repeated in accordance with the buffer occupancies. Within such a cycle, the FBCN mechanism in the access node ends up when a WECN ACK or an ECN ACK has been detected, and the source congestion control will be invoked by any of them. However, different individual congestion notification messages may arrive at the source terminal during a round-trip time. To achieve a quick alleviation of congestion and avoid unnecessary waste of bandwidth, the TCP source may react only to the first congestion notification message, and the remaining ones are ignored if they arrive in the same congestion window.” Ex. 1005, 13:40-61; Ex. 1003, ¶ 153.

Ma further provides filter 11 for “reducing the number of FBCN packets in order to achieve an effective control by avoiding the transmission of ineffective FBCN packets.” Ex. 1005, 8:10-12. Filter 11 “guarantees that a sufficient number of FBCN packets is transmitted in order to avoid an inadequate FBCN mechanism,” thus further preventing errors. *Id.*, 8:12-15; Ex. 1003, ¶ 154.

Thus, *Ma* discloses cyclical (periodic) reporting, even more than is necessary to prevent errors, and not simply threshold reporting. Ex. 1003, ¶ 155.

11. Claim 15: “The system of claim 9, where in the system is implemented within the queuing device.”

Ma discloses or renders obvious this claim. As explained for claim 9 (Section IV.A.2), *Ma* discloses a method for incorporating **an intermediate router**

R (“queuing device”) as a lossless processing stage in an IP subnetwork

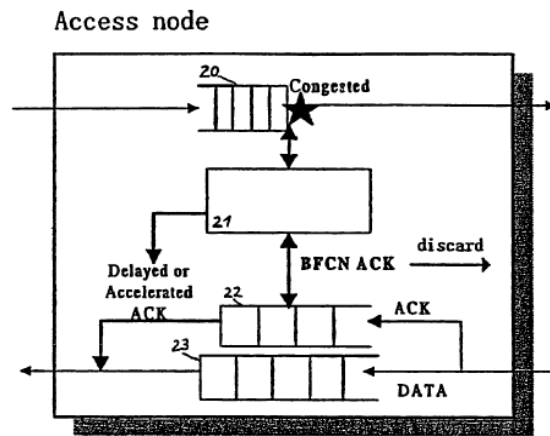
(“network device”) in a communications network between an edge device such as an access node (“upstream device”) and a gateway (“downstream device”) in the IP subnetwork. As explained for claim 9 (Section IV.A.2), the intermediate router (“queueing device”) of *Ma* meets all limitations of claim 9 and thus also satisfies claim 15.

12. Claim 23: “The method of claim 19, wherein the upstream device is another integrated device.”

Ma discloses or renders obvious claim 23.

The '973 device explains that an integrated device is “an integrated queueing and packet processing device”—or a device that integrates queueing and packet processing functionalities within a single device. Ex. 1001, 6:33-36. *Ma*’s access node (“upstream device”) performs both queueing and packet processing and therefore is an integrated device. *Ma*’s “FIG. 3 shows a basic functional block diagram of the access node of the IP network. According to FIG. 3, the access node comprises a forward buffer 20 for storing data packets to be transmitted in the forward direction, a backward acknowledgement buffer 22 for storing extracted acknowledgement packets received from the IP network, a backward data buffer 23 for storing data packets received from the IP network, and a congestion control unit 21 for performing congestion control based on a detection of an FBCN packet

(i.e. FBCN ACK) received from the IP network or based on a detection of a congestion at the forward buffer 20.” Ex. 1005, 10:6-17.



Ex. 1005, FIG. 3

B. Ground 2: *Ma* in view of *Enomoto* (Ground 2A) and *Ma* in view of *Kim* and *Enomoto* (Ground 2B) Renders Obvious Claims 3, 11, 21, and 28

1. **Claims 3, 11, 21, and 28: “wherein the monitoring further comprises: comparing a rate at which packets enter the queuing device to a rate at which packets exit the queuing device.”**

Claims 3, 11, 21, and 28 are identical aside from the independent claim from which they depend. Ex. 1003, ¶ 156.

Ma in combination with *Enomoto* (Ground 2a) or *Ma* in combination with *Kim* and *Enomoto* (Ground 2b) renders obvious claim 3. Ex. 1003, ¶ 157.

Ma discloses that monitoring congestion was known in the art but is not specific about comparing the rates of packets entering and exiting the queuing

device as the means for monitoring congestion. *See, e.g.*, Ex. 1005, 2:46-53. Ex. 1003, ¶ 158.

Enomoto discloses comparing the incoming and outgoing flow rates of packets. For example, *Enomoto* discloses that “[w]hen the OUT side flow controller 6-1 receives a packet from the switch unit 8 (in the case of IN side flow controller 6-2, from the packet receiver 4), the flow control decider 653-1 of flow detector 65-1 extracts the header contained in the received packet (step 2001) and transfers the extracted header to the flow comparator 652-1 (step 2002).” Ex. 1007, [0085]. *Enomoto* further discloses that “[w]hen receiving the header from the flow control decider 653-1, the flow comparator 652-1 compares individual information pieces ... with pieces of information stored in the flow control condition memory 651-1 (information pieces registered in respective entries) in correspondence to the above information pieces, respectively, to determine coincidence of the former information pieces with the latter information pieces (step 2003). ... On the other hand, when any information piece registered in the flow control condition memory 651-1 coincides with each information piece, the flow comparator 652-1 further decides necessity or non-necessity of collection of flow statistic information by consulting information indicative of the contents of flow control registered in the flow control condition memory 651-1 in correspondence to the coincident information pieces (step 2004).” *Id.*, [0086]. Ex. 1003, ¶ 159.

Ma discloses a “congestion notification unit 12 [that] **determines an average queue length.**” Ex. 1005, 7:57-58; *see also id.*, 4:11-16, 5:3-6. But *Ma* does not provide additional details about how the queue length is determined. A POSITA would have understood that there were several known ways to monitor congestion that were known in the art, one of which, as taught by *Enomoto*, is comparing incoming and outgoing packet flows in the queueing device. A POSITA analyzing *Ma*’s system would have looked to other references to supply the methodology for determining the queue depth—like *Enomoto*. And a POSITA would have reasonably expected success in implementing *Enomoto*’s standard procedure using a conventional flow comparator performing its routine function in *Ma* to achieve the expected flow comparison result. Ex. 1003, ¶ 160.

C. Ground 3: *Ma* in view of *McCrosky* (Ground 3A) and *Ma* in view of *Kim* and *McCrosky* (Ground 3B) Renders Obvious Claim 17

1. Claim 17: “The system of claim 9, wherein the system is implemented with a field programmable gate array (‘FPGA’) within the network device.”

Ma in combination with *McCrosky* (Ground 3a) or *Ma* in combination with *Kim* and *Enomoto* (Ground 3b) renders obvious claim 17. Ex. 1003, ¶ 161.

The ’973 patent acknowledges that implementing its claimed method using an FPGA was well within the purview of a POSITA. The ’973 patent mentions an FPGA at only two places of the specification. First, it states, “[t]he queuing device’s function may be replaced by a field programmable gate array (‘FPGA’)

customized by the network device manufacturer.” Ex. 1001, 5:41-43. Second, it states, “[t]he queue depth monitoring system may be an external device (e.g., an FPGA, a data processing system 300, etc.).” *Id.*, 5:63-64. Neither of these limited disclosures provides any enablement for a specialized implementation beyond the use of a generic FPGA according to its routine function, and a POSITA would have understood this. Ex. 1003, ¶ 162.

Ma’s network devices are generic network devices that a POSITA would have understood to include standard logic components—like an FPGA. *Ma* does not expressly disclose that its network device includes an FPGA, but FPGAs were commonly used at the time and it would have been obvious that *Ma*’s network device includes or would be modified to include an FPGA, as disclosed in *McCrosky*. Ex. 1003, ¶ 163.

McCrosky discloses a network device with a field programmable gate array. For example, *McCrosky* discloses that “[t]he logic of the ports and the switch core could be implemented in a great variety of ways, including but not limited to: a. custom hardware gates, b. gate arrays, c. **FPGAs**, d. software on microprocessors or microcontrollers, or e. any combination of the above.” Ex. 1008, 20:62-21:4; Ex. 1003, ¶ 164.

Given the limited disclosure of the ’973 patent itself, a POSITA would have understood that an FPGA was a routine mechanism for implementing queuing

systems in the art at the time, as taught by *McCrosky*. Therefore, a POSITA analyzing *Ma*'s system would have looked to other references for ways of implementing its methods, including those implementing a standard FPGS—like *McCrosky*. And a POSITA would have reasonably expected success in implementing *McCrosky*'s FPGA performing its routine function in *Ma* to achieve the expected result. Ex. 1003, ¶ 165.

V. NON-INSTITUTION UNDER 35 U.S.C. § 314 IS IMPROPER

At this time, no factors articulated in *Apple Inc. v. Fintiv, Inc.*, IPR2020-00019, Paper 11 at 5-6 (PTAB Mar. 20, 2020), weigh in favor of non-institution under 35 U.S.C. § 314(a) because no trial date has been set in the parallel litigation and the parallel litigation is administratively stayed pending proper service of the complaint.

VI. NON-INSTITUTION UNDER 35 U.S.C. § 325 IS IMPROPER

Non-institution under § 325 would also be improper. The prior art and grounds in the Petition were not previously considered by the Office and are materially different and not cumulative of what was previously considered.

VII. MANDATORY NOTICES UNDER 37 C.F.R. § 42.8

A. Real Party-in-Interest

The real parties in interest are ZTE (USA) Inc. and ZTE Corporation.

B. Related Matters

To Petitioner's knowledge, the '973 Patent is or has been involved in the following:

Name	Number	Court	Filed
<i>WSOU Investments, LLC d/b/a Brazos Licensing and Development v. ZTE Corporation</i>	6:22-cv-00137	W.D. Tex.	February 8, 2022
<i>WSOU Investments LLC D/B/A Brazos Licensing and Dev., v. Huawei Technologies Co., LTD.</i>	6:20-cv-00538	W.D. Tex.	June 17, 2020

C. Lead and Backup Counsel Information

Petitioner provides the following designation of counsel:

Lead Counsel	Back-Up Counsel
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Petitioner submits a Power of Attorney with this Petition. Petitioner consents to service by email at the addresses listed above.

VIII. GROUNDS FOR STANDING

The '973 patent is available for IPR and Petitioner is not barred or estopped from challenging the claims on the grounds identified herein.

IX. CONCLUSION

Petitioner respectfully requests that the Board grant *inter partes* review and find all claims unpatentable.

Dated: February 10, 2023

By: /Lionel M. Lavenue/
Lionel M. Lavenue, Lead Counsel
Reg. No. 46,859

CERTIFICATE OF COMPLIANCE

Pursuant to 37 C.F.R. § 42.24(a)(1)(i), the undersigned hereby certifies that the foregoing PETITION FOR *INTER PARTES* REVIEW OF U.S. PATENT NO. 7,872,973 contains 12,434 words, excluding parts of this Petition exempted under § 42.24(a), as measured by the word-processing system used to prepare this paper.

Dated: February 10, 2023

/Lionel M. Lavenue/
Lionel M. Lavenue, Lead Counsel
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CERTIFICATE OF SERVICE

The undersigned certifies that the foregoing **Petition for *Inter Partes* Review**, the associated **Power of Attorney**, and **Exhibits 1001 through 1015** are being served on February 10, 2023, by Priority Mail Express at the following address of record for the subject patent.

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