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465 Columbus Avenue
Suite 340
Valhalla, NY 10595

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JAGANNATHAN, MELANIE

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katelyn.mulroy@philips.com

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

Ex parte YINGWEI CHEN, RICHARD CHEN,
REUDIGER SCHMITT, and
SAI SHANKAR NANDAGOPALAN[1]

Appeal 2018-006506
Application 14/824,119
Technology Center 2400

Before JAMES R. HUGHES, ERIC S. FRAHM, and
MATTHEW J. McNEILL, *Administrative Patent Judges*.

FRAHM, *Administrative Patent Judge*.

DECISION ON APPEAL

STATEMENT OF THE CASE

Appellant appeals under 35 U.S.C. § 134(a) from the Examiner's Final rejection of claims 1–4.[2] We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

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[1] According to Appellants, Koninklijke Philips Electronics N.V. is the real party in interest. App. Br. 3.

[2] The Examiner indicates claim 5 contains allowable subject matter (Ans. 6), and thus claim 5 is not among the rejected claims before us on appeal.

Disclosed Invention

Appellant's disclosed invention relates to packet scheduling in a QoS (quality of service) network architecture. Spec. 2:15–2:19. In a preferred embodiment, delay-sensitive traffic (video, voice, audio) and non-delay-sensitive traffic are assigned to separate queues. Spec. 3:22–3:26. The queues are weighted and packets are scheduled for transmission based on the respective queue weights, where the weights are dynamically adjustable. Spec. 3:15–3:21, 3:28–4:4.

Exemplary Claim

Claim 1, reproduced below, is illustrative of the claimed subject matter:

> 1. An apparatus, comprising:
>
> a memory configured to comprise more than one weighted queue;
>
> a scheduler configured to receive a flow and distribute at least one packet of the received flow to at least one weighted queue of the more than one weighted queues, the scheduler configured to distribute the at least one packet of the received flow to the at least one weighted queue based on a delay sensitivity of the received flow; and
>
> a monitor configured to track at least a per-byte transmission time of at least one of the more than one weighted queues and adjust a weight of at least one weighted queue when the per-byte transmission time of the at least one weighted queue exceeds a threshold.

App. Br. 17 (Claims Appendix).

The Examiner's Rejection

Claims 1–4 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Wang et al. (US 6,990,113 B1; iss. Jan. 24, 2006, hereinafter "Wang") and Lakkakorpi (US 2004/0153564 A1; pub. Aug. 5, 2004).

ANALYSIS

Claim 1

Appellant contends Lakkakorpi fails to teach the claim 1 limitation of "track[ing] at least a per-byte transmission time of at least one of the more than one weighted queues and adjust[ing] a weight of at least one weighted queue when the per-byte transmission time of the at least one weighted queue exceeds a threshold." App. Br. 17, (Claims Appendix). Appellant also contends it would not have been obvious to modify Wang in view of Lakkakorpi to adjust a queue weight based on a per-byte transmission time. App. Br. 8. We are not persuaded of Examiner error.

Lakkakorpi describes a packet scheduling architecture for output queues in an IP router. Lakkakorpi ¶ 32. Network traffic is classified based on packet headers and placed in one of several queues, and the order of removal of packets from the queues is determined based on the respective weights allocated to the queues. Lakkakorpi ¶¶ 33–34. The weights of the queues can be adjusted at predetermined intervals, for example, as a function of a "moving average of traffic characteristics (e.g. byte count, flow count etc.) at queue C_i within the measurement period T." Lakkakorpi ¶¶ 36–37.

Appellant argues "Lakkakorpi describes a moving average of traffic characteristics as byte count or flow count, but not per-byte transmission

time." App. Br. 10–11; *see also* Reply Br. 6. Appellant's Specification, however, includes discussion of "a time monitor module 104 that computes *window-averaged transmit time per byte*, tracks increases in this average time, adjusts each of the weights." Spec. 4:9–4:11 (emphasis added). Thus, in light of the Specification, we interpret claim 1 as encompassing a "per-byte transmission time" that is an average time. We agree with the Examiner (*see* Ans. 10–11) and find that Lakkakorpi's "moving average of traffic characteristics (e.g. byte count, flow count etc.) at queue C_i within the measurement period T" (Lakkakorpi ¶¶ 36–37) at least suggests such an average per-byte transmission time.[3]

Further, Appellant does not persuade us of error in the Examiner's combination of Lakkakorpi with Wang. The Examiner proposes using Lakkakorpi's moving average of byte count over a period of time as a factor for adjusting queue weights in Wang. *See* Final Act. 4–5; *see also* Ans. 10–11. Appellant argues the "per-byte transmission time" recited in claim 1 "cannot be separated and examined in [a] vacuum from the rest of the limitation associated with that feature." App. Br. 8. Rather, "the entire limitation of '**a monitor configured to track at least a per-byte transmission time of at least one of the more than one weighted queues and adjust a weight of at least one weighted queue when the per-byte transmission time of the at least one weighted queue exceeds a**

[3] We note that in the Reply Brief Appellant argues "Wang fails to discuss the feature 'a monitor configured to track at least a transmission time of at least one of the more than one weighted queues' recited in claim 1." Reply Br. 4. However, the Examiner relies on Lakkakorpi for the claim 1 feature of tracking "per-byte transmission time." Ans. 10–11; *see also* Final Act. 4–5.

threshold' as recited in claim 1 must be considered in its entirety, and not in a piecemeal fashion." App. Br. 8. Appellant's argument, however, misunderstands the nature of the obviousness inquiry. "The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. 398, 416 (2007). Accordingly, there is nothing improper about the Examiner concluding that Lakkakorpi teaches an aspect of the disputed limitation, while concluding that Wang teaches the remainder of the limitation. Rather, it is incumbent upon the Office to determine whether an application "claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field." *Id.*

Appellant has not provided a persuasive reason why the Examiner's combination of Wang and Lakkakorpi would not have been obvious. Rather, the fact that Wang uses average queue length as a factor in adjusting queue weights, where queue length is related to delay (*see* Wang, col. 5, l. 15–col. 6, l. 51), suggests the substitution of another known time-related factor, such as Lakkakorpi's moving average of byte count over a period of time. *See* Lakkakorpi, ¶¶ 36–37. Moreover, Appellant has not specifically explained why the Examiner's stated motivation for combining Lakkakorpi with Wang—"to improve the predictability of queuing delays" (Final Act. 5)—is insufficient. Although Appellant argues "there is **no mention** in Lakkakorpi regarding 'the determination of a traffic characteristic is for the purpose of improving queuing delays'" (Reply Br. 5), Lakkakorpi is in fact devoted to describing a queue weighting function based on traffic characteristics, for example, byte count over a period of time, such that

"scheduling can be adapted to changes in the traffic mix to achieve more predictable maximum delays." Lakkakorpi, ¶¶ 36, 37, and 46.

We are, therefore, not persuaded the Examiner erred in rejecting claim 1.

Claim 2

Appellant contends Wang fails to teach the claim 2 limitations of "determin[ing] a delay sensitivity of the received flow; and assign[ing] a weighted queue to each of the received delay sensitive flow." App. Br. 11–12. We are not persuaded of Examiner error.

Wang discloses a router where each output buffer includes three queues—an EF queue for premium service packets, an AF queue for assured service packets, and a BE queue for best-effort packets. Wang, col. 5, ll. 4–11. An EF, or expedited forwarding, queue provides "low loss rate, low delay, low delay jitter and assured throughput." Wang, col. 3, ll 2–5. In order to meet the delay requirements of premium service packets, the EF queue is weighted to provide more bandwidth on the output line of the router. Wang, col. 5, ll 20–32. We agree with the Examiner (*see* Ans. 12–13) and conclude that the operation of Wang's router that includes an EF queue teaches the claim 2 limitations of "determin[ing] a delay sensitivity of the received flow; and assign[ing] a weighted queue to each of the received delay sensitive flow."

We are, therefore, not persuaded the Examiner erred in rejecting claim 2.

Claim 3

Appellant contends Wang fails to teach the claim 3 limitations "bundle one or more non-delay sensitive flows into a weighted queue" and

"the received delay sensitive flows are each assigned a predetermined weighted queue." We are not persuaded of Examiner error.

First, as discussed above regarding claim 2, we conclude Wang teaches assigning a delay-sensitive flow to a weighted queue. Second, we conclude Wang also teaches bundling one or more non-delay-sensitive flows into a weighted queue. Specifically, Wang's router includes a BE (best effort) queue (Wang, col. 5, ll. 4–11), where "best-effort service is the default behavior of packet-switched networks" in which routers "may drop packets indiscriminately in the event of network congestion." Wang, col. 1, ll. 14–18. We agree with the Examiner (*see* Ans. 13–14) and conclude the operation of Wang's router that includes a BE queue teaches bundling one or more non-delay-sensitive flows into a weighted queue.

We are, therefore, not persuaded the Examiner erred in rejecting claim 3.

Claim 4

Appellant contends Wang fails to teach "wherein the scheduler comprises a selected one of a queuing module, an operating system kernel, and a device driver," as recited in claim 4. We are not persuaded of Examiner error.

We note that the language of claim 1 requires only that the "scheduler" be one of a "queuing module, an operating system kernel, and a device driver." Appellant has not pointed to an express definition of the term "queuing module" in the Specification. We conclude that the broadest reasonable interpretation of the term "queuing module" is some hardware or software, or combination of hardware and software, that performs queuing of packets. We agree with the Examiner (*see* Final Act. 6) that Wang's

router meets the claim 4 limitation of a scheduler comprising a queuing module because it performs queuing of packets. Wang, col. 5, ll. 4–14.

We are, therefore, not persuaded the Examiner erred in rejecting claim 4.

CONCLUSION

The Examiner did not err in rejecting claims 1–4 under 35 U.S.C. § 103(a).

DECISION

We affirm the Examiner's decision to reject claims 1–4.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a). *See* 37 C.F.R. § 41.50(f).

AFFIRMED