

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TRANSCORE, LP

Petitioner,

v.

HAND HELD PRODUCTS, INC.,

Patent Owner

IPR2024-00391

Patent 8,141,784

PETITION FOR *INTER PARTES* REVIEW OF

U.S. PATENT NO. 8,141,784

Mail Stop PATENT BOARD
Patent Trial and Appeal Board
U.S. Patent & Trademark Office
P.O. Box 1450
Alexandria, VA 22313–1450

TABLE OF CONTENTS

I.	Introduction.....	1
II.	Grounds for Standing (37 C.F.R. § 42.104(a)).....	2
III.	Identification of Challenge (37 C.F.R. § 42.104(b)).....	2
A.	Citation of Prior Art	2
B.	Statutory Grounds for Challenge.....	3
IV.	Background – the ’784 Patent	4
A.	Overview of the ’784 patent.....	4
B.	The ’784 patent’s prosecution history	5
C.	Encoded Information Reading Terminals were Known in the Art	6
D.	The Prior Art.....	7
1.	Tolonen.....	7
2.	Katz.....	9
3.	Ishizu	11
E.	Level of Ordinary Skill in the Art	12
F.	Claim Construction.....	12
V.	GROUND 1: Anticipation of Challenged Claims 1–23 by Tolonen.....	12
A.	Tolonen Invalidates the Claims.....	12
1.	Claim 1	12
2.	Claim 2	25
3.	Claim 3	26
4.	Claim 4	29
5.	Claim 5	31
6.	Claim 6	34
7.	Claim 7	35
8.	Claim 8	37
9.	Claims 9-14	38

10. Claim 15	38
11. Claim 16	39
12. Claim 17	40
13. Claim 18	41
14. Claim 19	43
15. Claim 20	43
16. Claims 21-23.	44
VI. GROUND 2: Obviousness of Claims 1–23 over Tolonen in view of Katz.....	44
A. Motivation to Combine	44
B. Tolonen in view of Katz Invalidates the Claims	48
1. Claim 1	49
2. Claim 2	55
3. Claim 18	56
4. Claim 19	57
5. Claim 20	57
VII. GROUND 3: Anticipation of Claims 1 and 2 over Katz.	60
A. Katz invalidates the claims.....	60
1. Claim 1	60
2. Claim 2	70
VIII. GROUND 4: Obviousness of Claims 3–23 over Katz in view of Ishizu.	70
A. Motivation to Combine	70
B. Katz in view of Ishizu Invalidates the Claims	73
1. Claim 3	73
2. Claim 4	74
3. Claim 5	76
4. Claim 6	78
5. Claim 7	79

6. Claim 8	80
7. Claim 9-14	81
8. Claim 15	81
9. Claim 16	81
10. Claim 17	82
11. Claim 18	83
12. Claim 19	84
13. Claim 20	84
14. Claims 21 to 23	86
IX. Conclusion	87
X. Mandatory Notices	88
A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1)	88
B. Related Matters Under 37 C.F.R. § 42.8(b)(2)	88
C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)	88

EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent 8,141,784 to Wang, <i>et al.</i> (“the ’784 patent”).
1002	File History for U.S. Patent 8,141,784
1003	Declaration of Daniel W. Engels, Ph.D
1004	Curriculum Vitae of Daniel W. Engels, Ph.D
1005	U.S. Patent Publication 2010/0056200 to Tolonen (“Tolonen”)
1006	David Katz, <i>et al.</i> , “Fast, Versatile Blackfin® Processors Handle Advanced RFID Reader Applications,” ANALOG DIALOGUE 40-09 (Sept. 2006).
1007	Analog Devices, Blackfin Embedded Processor, ADSP-BF531/ADSP-BF532 (Aug. 2006) (“ADSP-BF531 Data Sheet”)
1008	Analog Devices, Blackfin Embedded Symmetric Multiprocessor, ADSP-BF561 (May 2006) (“ADSP-BF561 Data Sheet”)
1009	Analog Devices, “Mixed-Signal Front-End (MxFE) Baseband Transceiver for Broadband Applications,” AD9861 (Nov. 2003) (“AD9861 Data Sheet”)
1010	U.S. Patent Publication 2010/0020763 A1 to Ishizu, <i>et al.</i> (“Ishizu”)
1011	Tuttlebee, Baseband Technology for 3G Handsets and Basestations (Wiley 2004) (“Tuttlebee II”)
1012	Tuttlebee, Enabling Technologies (Wiley 2002) (“Tuttlebee I”)
1013	McGraw-Hill, Dictionary of Scientific and Technical Terms (5th ed. 1994)
1014	Analog Devices, Blackfin Embedded Processor, ADSP-BF536 (Apr. 2006) (“ADSP-BF536 Data Sheet”)
1015	Atheros, AR5007EG Single-chip IEEE 802.11b/g WLAN solution
1016	ISO/IEC 15693-3 First Edition (2001)

Exhibit	Description
1017	EPCglobal, Radio-Frequency Identify Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz–960 MHz version 1.1.0 (2005)

I. Introduction

TransCore, LP (“Petitioner”) requests *Inter Partes* Review of claims 1–23 of U.S. Patent No. 8,141,784 (“the ’784 patent”).

The ’784 patent describes and claims a system (e.g., encoded information reading terminal) to communicate encoded messages via wireless radio signals. The ’784 patent expresses the need for wireless communication interfaces to “support more than one communication protocol and/or standard,” but accomplishes this goal using known technologies. S, the ’784 patent describes and claims an encoded information reading terminal that connects, via a bus, conventional wireless communication chipsets (e.g., cellular, Wi-Fi, etc.) and an encoded reading device (e.g., RFID reader, barcode scanner) to a processor running a baseband software. As the prior art demonstrates, this was not novel.

The ’784 patent additionally describes and claims a means for dynamically switching communication protocols, networks, and/or parameters based on user preferences. But as the art demonstrates, this too was not a novel concept.

This Petition, supported by the Declaration of Dr. Daniel W. Engels, demonstrates the challenged claims’ unpatentability. Petitioner requests the Board institute trial and cancel the challenged claims.

II. Grounds for Standing (37 C.F.R. § 42.104(a))

Petitioner certifies the '784 patent is available for *Inter Partes* Review and that Petitioner is not barred nor otherwise estopped from requesting *Inter Partes* Review on the grounds identified herein.

III. Identification of Challenge (37 C.F.R. § 42.104(b))

The '784 patent was filed Sept. 25, 2009, indicating pre-AIA 35 U.S.C. §§ 102–13 governs. All references asserted herein are pursuant to pre-AIA statutes. *See* MPEP § 2159.01; Leahy-Smith America Invents Act, Pub. L. No. 112-29, 125 Stat. 284, 293 § 3(n)(1) (2011).

A. Citation of Prior Art

Each asserted reference was published or filed before the '784 patent's filing date. Petitioner relies on the following art:

U.S. Patent Publication No. 2010/0056200 A1 (Ex. 1005, "Tolonen"), filed Sept. 3, 2008, and published Mar. 4, 2010, is prior art under 35 U.S.C. § 102(e).

Fast, Versatile Blackfin® Processors Handle Advanced RFID Reader Applications, (Ex. 1006, "Katz"), published in September 2006, is prior art under 35 U.S.C. § 102(b). Katz also incorporates by reference three datasheets: **ADSP-BF531/ADSP-BF532 Data Sheet**, (Ex. 1007, "ADSP-BF531 Data Sheet"), published in August 2006, is prior art under 35 U.S.C. § 102(b); **ADSP-BF561 Data Sheet**, (Ex. 1008, "ADSP-BF561 Data Sheet"), published in May 2006, is prior art

under 35 U.S.C. § 102(b); **AD9861 Data Sheet**, (Ex. 1009, “AD9861 Data Sheet”) published in November 2003, is prior art under 35 U.S.C. § 102(b).

U.S. Patent Publication No. 2010/0020763 A1 (Ex. 1010, “Ishizu”), filed July 28, 2009, and published Jan. 28, 2010, is prior art under 35 U.S.C. § 102(e).

Tuttlebee, Baseband Technology for 3G Handsets and Basestations (Ex. 1011, “Tuttlebee II”) (Wiley 2004).

Tuttlebee, Enabling Technologies (Ex. 1012, “Tuttlebee I”) (Wiley 2002).

B. Statutory Grounds for Challenge

Petitioner requests cancellation of the following claims on the following statutory grounds:

GROUND 1: Claims 1–23 are anticipated over Tolonen pursuant to 35 U.S.C. § 102 or obvious over Tolonen in view of a POSITA’s knowledge, pursuant to 35 U.S.C. § 103.

GROUND 2: Claims 1–23 are obvious over Tolonen in view of Katz pursuant to 35 U.S.C. § 103.

GROUND 3: Claims 1–2 are anticipated over Katz pursuant to 35 U.S.C. § 102.

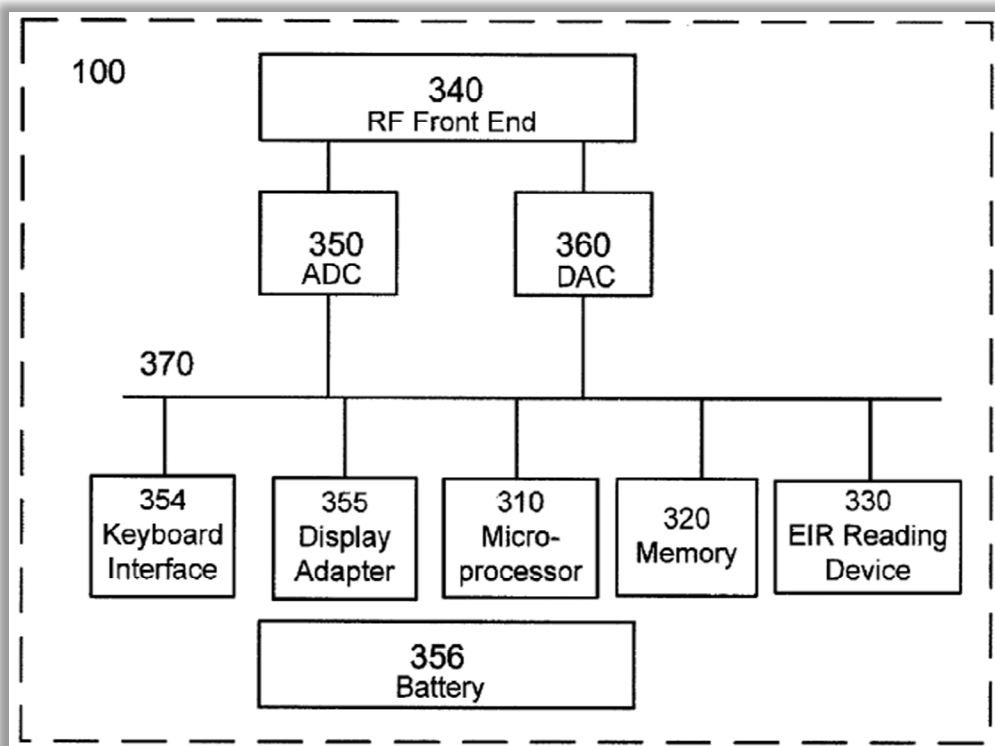
GROUND 4: Claims 3–23 are obvious over Katz in view of Ishizu pursuant to 35 U.S.C. § 103.

IV. Background – the '784 Patent

A. Overview of the '784 patent

The '784 patent is directed to “encoded information reading (EIR) terminals,” more specifically, to an EIR terminal comprising a multi-protocol wireless communication interface.” Ex. 1001, 1:7–11. The '784 patent suggests the “need for further advances in EIR terminals and systems which would support multiple communication protocols and standards.” *Id.* 1:24–26.

The '784 patent's EIR terminal connects a microprocessor, a memory, a wireless communication interface, and an encoded information reading device to a system bus. *Id.* 1:30–35.



Ex. 1001, Fig. 3.

To select different wireless communication networks, communication protocols, or parameters, the '784 patent describes a “wireless communication protocol selector software program.” *Id.* 9:38-42. The '784 patent explains that the “wireless communication protocol selector software program can optimize a value of a user-defined criterion,” which “can be calculated based on one or more of the following parameters: frequency range, network status, signal strength, service cost, communication channel throughput, and user preferences ... e.g., by network preference, service preference, protocol preference, or frequency preference.” *Id.* 9:42-51. For example, the '784 patent contemplates that calculating the user-defined criterion may involve calculating “a weighted sum of components each of which is represented by either a parameter itself ... or a difference between the value of the parameter and the desired parameter,” “the square root of a weighted sum of squares of [the] components,” or “other methods of calculating the user-defined criterion value ... within the scope and spirit of the invention.” *Id.* 9:54-67.

B. The '784 patent's prosecution history

The '784 patent's prosecution history does not exemplify thorough examination.

The '784 patent was once rejected. The non-final rejection raised a single reference, Yeakley, U.S. Pub. 2007/0152058, that disclosed “a host computer ... a

microprocessor including a memory, a user interface, an output interface[,] ... [and] a Bluetooth radio transceiver device.” Ex. 1002 at 366. In connection with Yeakley, official notice was taken that (1) “Bluetooth communications are typically encrypted,” (2) “[i]t would have been obvious ... to use encrypted Bluetooth signals in Yeakley,” and (3) “A/D conversion is typical and old and well known in bar code readers.” *Id.* at 367. This argument was cited to summarily reject all pending claims.

In response, Applicant simply argued that a *prima facie* case of obviousness had not been met because it was both improper to group the claims for the rejection and to take official notice without documentary evidence. *Id.* at 301-302. These “arguments ... [we]re deemed persuasive,” and the application was, thereafter, granted. *Id.* at 286.

C. Encoded Information Reading Terminals were Known in the Art

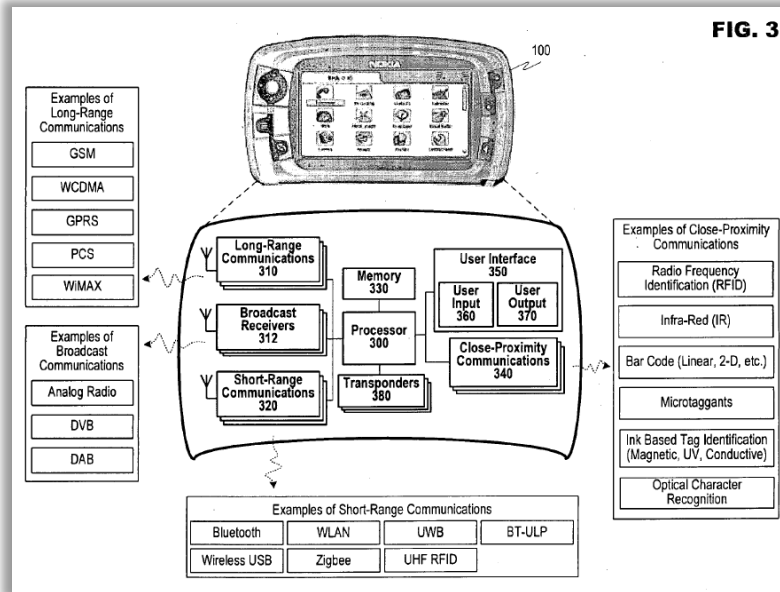
Despite the examiner’s acquiescence, everything claimed by the ’784 patent was well-known and conventional. For example, RFID readers and Bar Code readers were conventional in the art. *See, e.g.*, Ex. 1006 at 1; Ex. 1005 ¶ 56; Ex. 1003, ¶¶ 45-47. At the time the ’784 patent was filed, it was also known that software defined radios (“SDR”) were capable of implementing multiple wireless communication protocols into a single wireless device, “allow[ing] a wireless device to change functionality by switching in different software stacks (or software-like objects).” Ex. 1011 at 7 (Chapter by Mark Cummings); *see also, e.g.*, Ex. 1005 ¶ 56, Ex. 1006

at 2–3, Ex. 1010 ¶ 37; Ex. 1003, ¶ 45. Even the hardware limitations of the '798 patent were conventional. For example, it was well known that “all wireless systems include ... [antenna, RF Front-End, Baseband, and Controller] subsystems,” where the “baseband subsystem sits between the RF front-end and the controller ... [and] is responsible for end-user data encoding/decoding and signal modulation/demodulation.” Ex. 1011 at 7; Ex. 1012 at 79; Ex. 1003, ¶ 46. Finally, as the art demonstrates, it was known that multiple software defined radios and RFID/barcode readers could be integrated into a single wireless device and that software could dynamically control the selection of communication networks, protocols, and/or protocols. *See e.g.*, Ex. 1006 1-3; Ex. 1005 ¶¶ 50-56, 99-112, Figs. 3, 13, 14a-b; Ex. 1003, ¶ 47. Accordingly, as demonstrated in the petition that follows, the '784 patent describes a non-novel and/or obvious invention.

D. The Prior Art

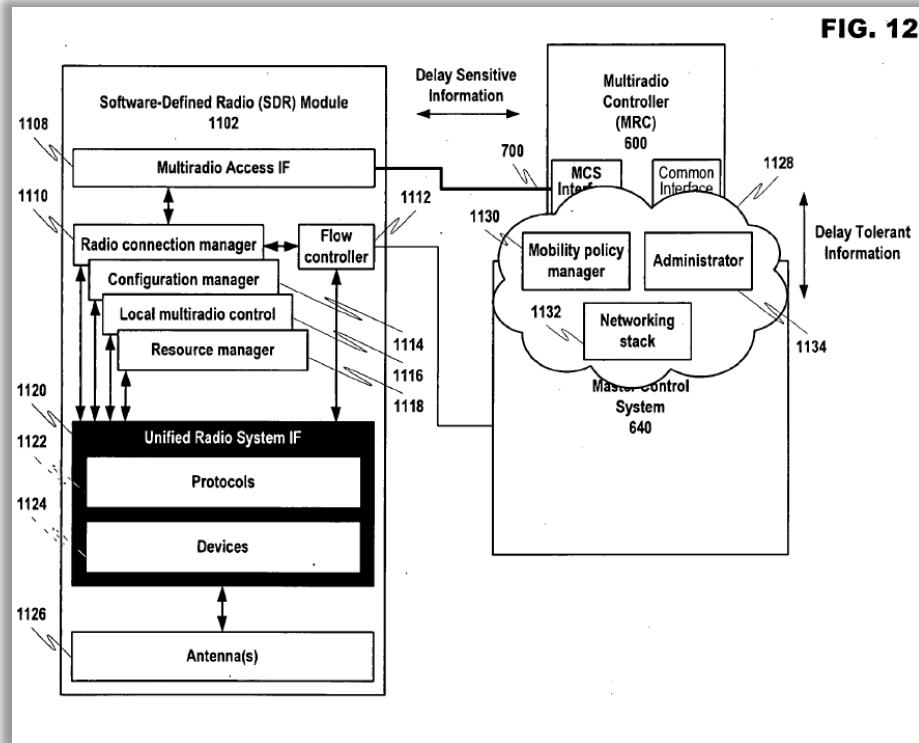
1. Tolonen

Tolonen teaches a WDC that includes communication modules 310, 312, and 320 for long-range, broadcast, and short-range, respectively. Ex. 1005 ¶ 50. Any one of these modules may be implemented through an SDR. Ex. 1005 ¶ 92. As shown in Figure 3, the WDC include communication protocols like Bluetooth and WLAN and close-proximity communications such as RFID and/or Bar Code.



Ex. 1005, Fig. 3.

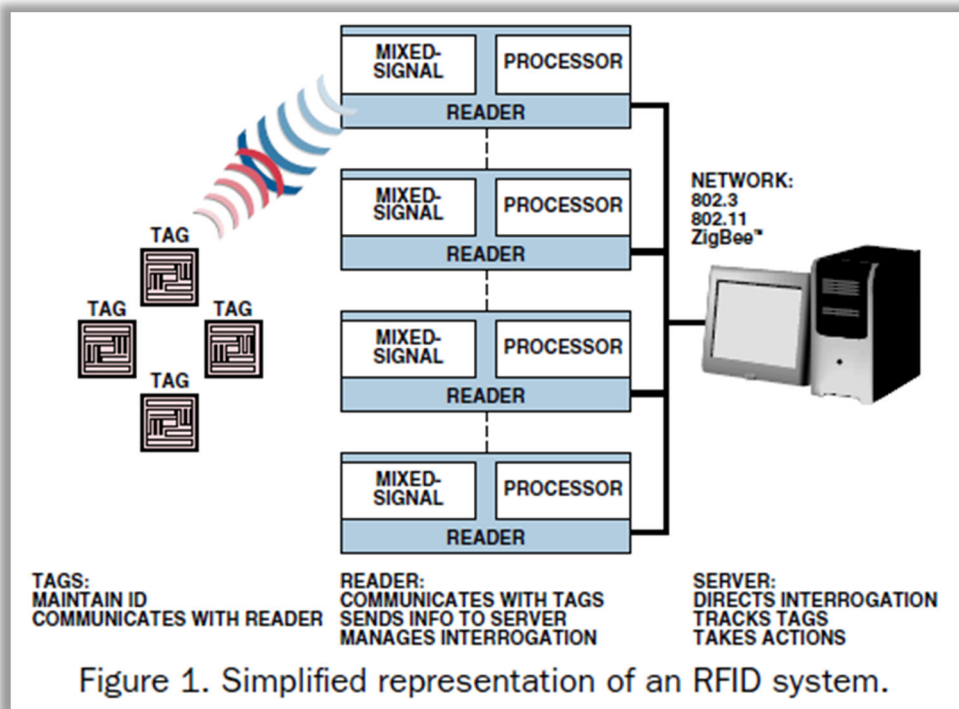
Each of Tolonen's communication modules include the hardware for transmitting and receiving signals, "includ[ing] [the] components (e.g., electronics) that perform functions, such as modulation, demodulation, amplification, and filtering" and are connected by a bus to the processor. Tolonen's processor runs software for "calculat[ing], translat[ing], conver[ting], and/or packetizing ... data" for transmission, among other things. Ex. 1005 ¶¶ 59-60, 62. Tolonen's processor also manages the scheduling for the communication modules and defines the particular wireless transport. *Id.* ¶¶ 94-98.



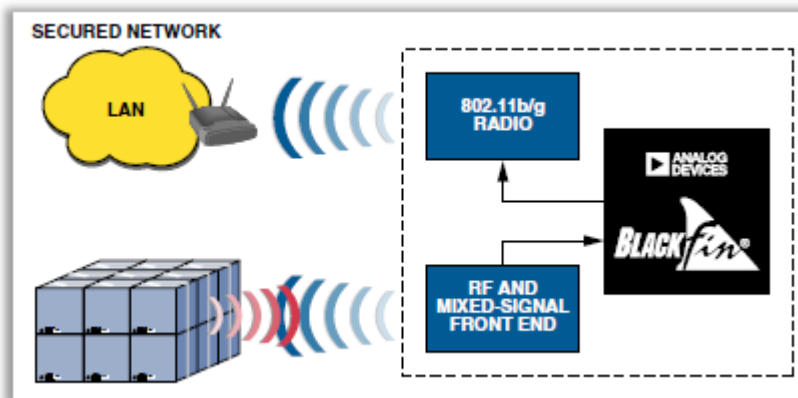
Ex. 1005, Fig. 12.

2. Katz

Katz teaches an RFID system (e.g., tag reader) for interrogating, decoding, and processing tag information and a backend server that houses a tag database. Ex. 1006 at 1. Katz's RFID Reader includes a Mixed Signal RF Front End, a Blackfin processor, and, in one implementation, an IEEE 802.11 chipset for communicating with the backend server. *Id.* at 1–2; Figs. 1, 5.



Ex. 1006, Fig. 1.



Ex. 1006, Fig. 5.

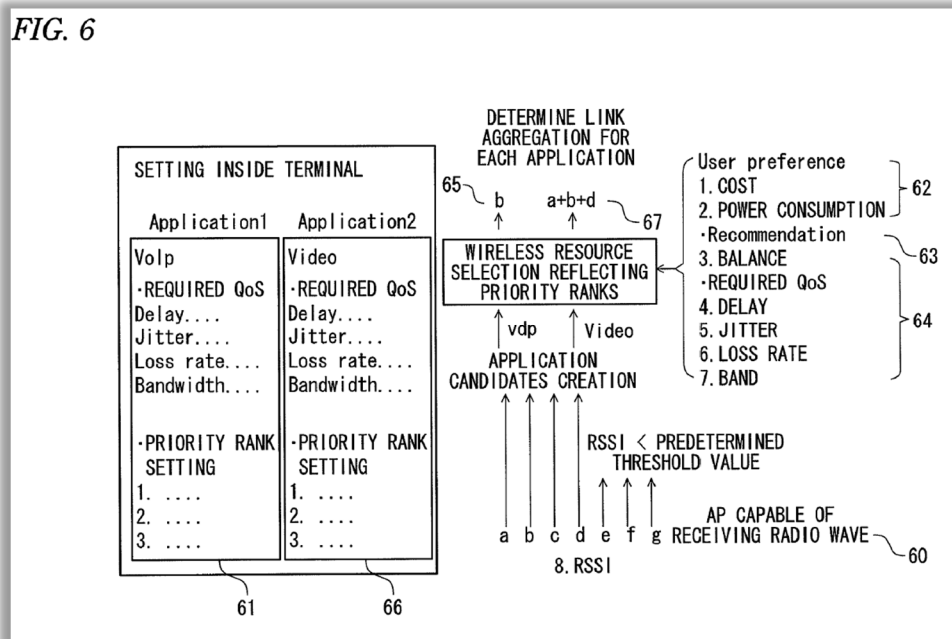
Katz's Blackfin processor executes software to filter and transform radio signals as well as translate and filter the outputted data. Ex. 1006 at 2–3. Katz also

employs ADC/DACs in its radio frequency front end to transform radio signals between the analog and digital domains. *Id.* at 3.

3. Ishizu

Ishizu teaches a dynamically reconfigurable wireless communication terminal based on user input. Ex. 1010 ¶¶ 30, 67. Ishizu's terminal includes a data communication aggregation device comprised of a processor, communication modules, a keyboard, and hard disk that stores connection policy information.

Ishizu teaches a means for dynamically reconfiguring a wireless network. For example, after evaluating the user input and the connection policy information, Ishizu can dynamically reconfigure the terminal to select a wireless network, as shown below in Figure 6. *Id.* ¶¶ 64–67.



Ex. 1010, Fig. 6.

E. Level of Ordinary Skill in the Art

A person of ordinary skill in the art (“POSITA”) would have had at least the equivalent of a bachelor’s degree in electrical engineering, computer engineering, physics, or the equivalent, and would have at least two years of relevant experience working with RFID systems. Ex. 1003 ¶¶ 21-24.

F. Claim Construction

Petitioner does not believe any terms in the ’784 patent require construction in this proceeding. However, should Patent Owner determine otherwise, Petitioner reserves the right to respond to Patent Owner’s claim construction positions. *Vivid Techs., Inc. v. Am. Sci. & Eng’g, Inc.*, 200 F.3d 795, 803 (Fed. Cir. 1999).

V. GROUND 1: Anticipation of Challenged Claims 1–23 by Tolonen

A. Tolonen Invalidates the Claims

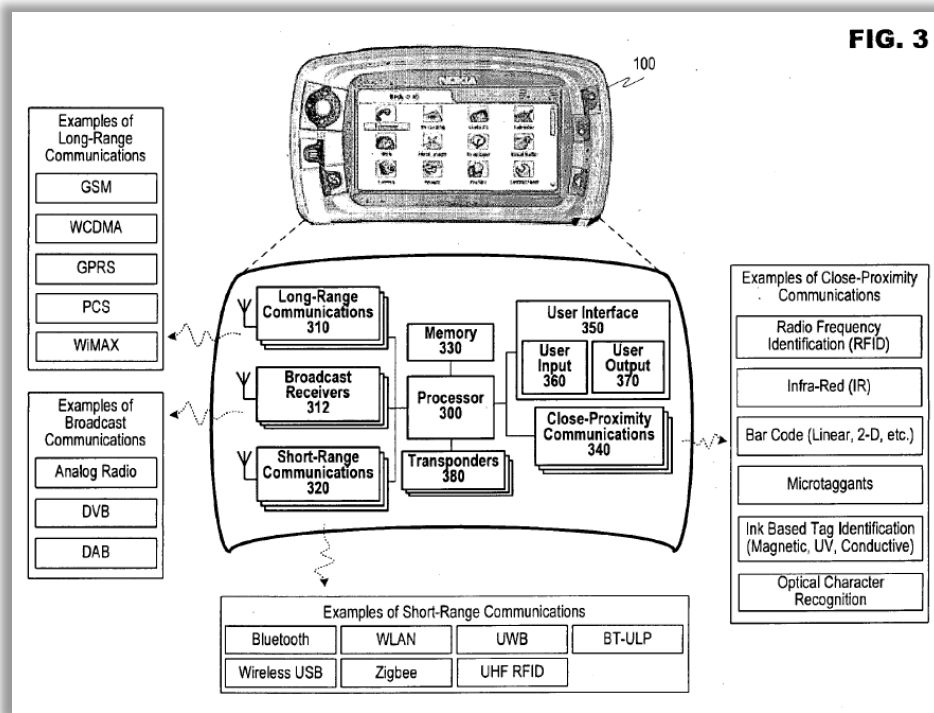
1. Claim 1

(a) *I[pre] Tolonen discloses “[a]n encoded information reading (EIR) terminal.”*

Tolonen discloses “a system for facilitating wireless communication connections between configurable radio devices.” Ex. 1005 ¶ 2. As shown in Figure 3 below, Tolonen discloses a wireless communication device (“WCD”) comprising at least a processor, a memory, a user interface, and multiple communication methods and devices, including a radio frequency identification (RFID) device

and/or a bar code reading device, to interface with other devices. *Id.* ¶¶ 50–57, Fig.

3.



Ex. 1005, Fig. 3.

(b) *1[A] Tolonen's EIR terminal comprises "a microprocessor electrically coupled to a system bus."*

Tolonen's WCD 100 includes processor 300 or, optionally, "one or more microprocessors" responsible for "control[ing] overall device operation" and "executing software instructions stored in memory 330." Ex. 1005 ¶ 50; *see also, id.* ¶ 52. Tolonen further teaches that the "processor 300 [or microprocessors], communications sections 310, 312, and 320, memory 330, close-proximity communications 340, user interface 350, transponder 380, etc. ... are coupled together via one or more wired and/or wireless bus interfaces." *Id.* ¶ 59; *see also, id.*

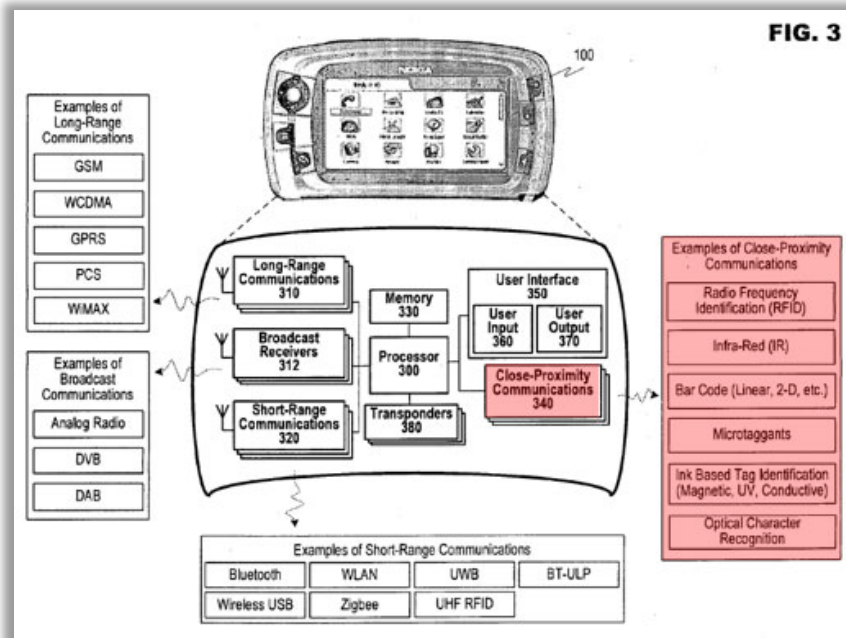
¶¶ 71–73, Fig. 8A (describing the use of an I²C bus to connect the processor 300 with communication modules 310, 312, 320, and 340).

(c) *1[B] Tolonen’s EIR terminal comprises “a memory communicatively coupled to said microprocessor.”*

Tolonen’s WCD 100 includes a memory connected to one or more microprocessors using a wired or wireless method. Ex. 1005 ¶ 59 (“processor 300 ... memory 330 ... are coupled together via one or more wired and/or wireless bus interfaces.”). Tolonen’s microprocessors “execut[e] [the] software instructions stored in memory 330.” *See id.* ¶¶ 50, 59, Fig. 3; *see also, supra* Section V.A.1.c.

(d) *1[C] Tolonen’s EIR terminal comprises “an encoded information reading (EIR) device selected from the group consisting of a bar code reading device, an RFID reading device, and a card reading device, said EIR device configured to perform at least one of outputting raw message data containing an encoded message and outputting decoded message data corresponding to an encoded message.”*

Tolonen’s close-proximity communication module 340 is an encoded information reading (EIR) device, as it “provide[s] functionality related to the short-range scanning of machine-readable data.” Ex. 1005 ¶ 56; Fig. 3. For example, Tolonen contemplates that the close-proximity communications module 340 includes “Radio Frequency Identification (RFID),” “Bar Code (Linear, 2-D, etc.),” “Optical Character Recognition,” amongst others. *Id.*; *see also*, Ex. 1003 ¶ 63.



Ex. 1005, Fig. 3 (annotated).

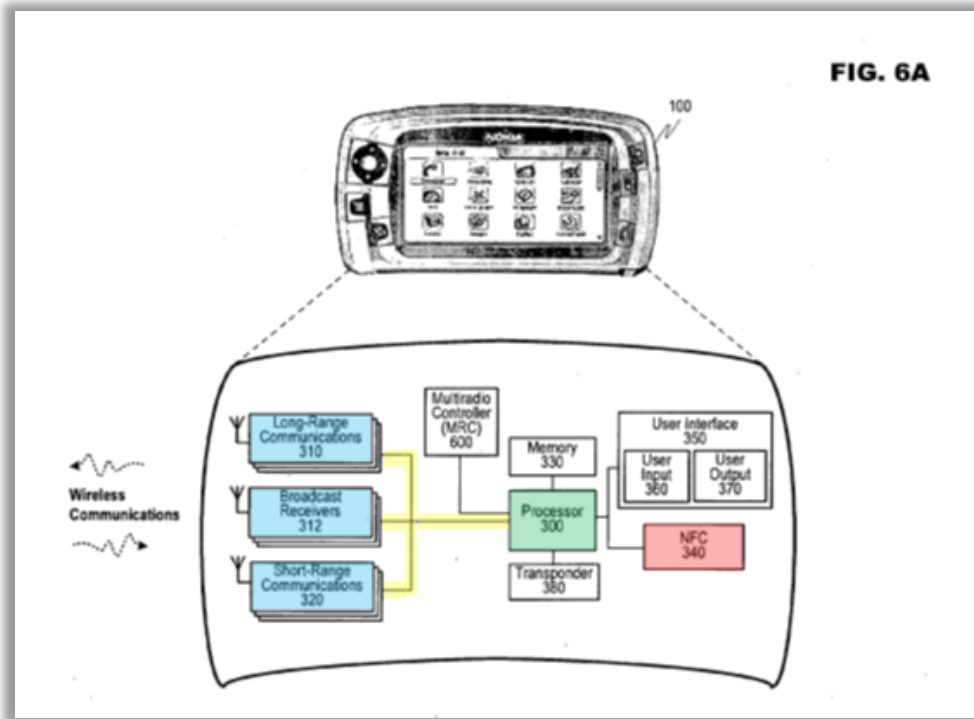
Tolonen's close-proximity communications 340 are configured to either output raw message data containing an encoded message or output decoded message data corresponding to an encoded message. *See* Ex. 1003 ¶ 64. Tolonen's WCD includes close-proximity communication device 340, which includes functionality for "control[ing] the reception of signals from an RFID transponder" or for reading machine-readable data such as linear bar codes (e.g., UPC symbols), 2-D bar codes (e.g., QR), and/or optical character recognition, amongst others. Ex. 1005 ¶¶ 41, 56, 58–59. Machine readable data, such as barcodes for example, is encoded data. Ex. 1003 ¶ 64. So, for Tolonen's WCD to communicate by receiving machine-readable data, Tolonen's RFID reader must either capture and output raw encoded data to the WCD's processor or it must capture, decode, and output the decoded message data

to the processor. *Id.* Tolonen’s teaching that the WCD 100 “may ... incorporate components such as optical detectors ... or other sensors known in the art for **interpreting** machine-readable information” indicates that the Tolonen contemplated the encoded reader, itself, performing the decoding (*i.e.*, interpreting) and, thus, outputting a decoded message. Ex. 1005 ¶ 56; *see also*, Ex. 1003, ¶ 65.

- (e) *1[D] Tolonen’s EIR terminal comprises “a wireless communication interface comprising a radio frequency front end configured to perform at least one of receiving a first radio signal and transmitting a second radio signal, said radio frequency front end electrically coupled to at least one of an analog-to-digital converter (ADC) electrically coupled to said system bus and a digital-to-analog converter (DAC) electrically coupled to said system bus.”*

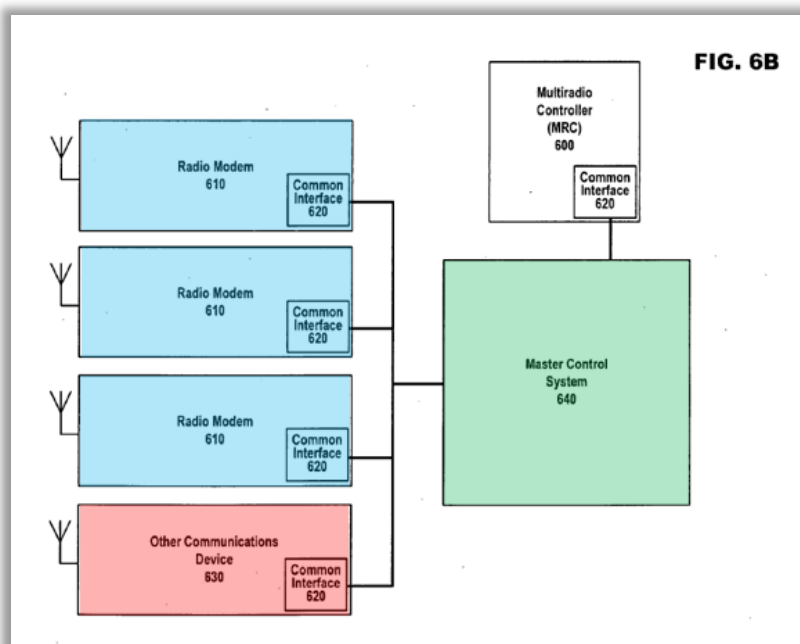
Tolonen’s communication modules 310, 312, and 320 (“communication modules”) include wireless communication interfaces that each, inherently, comprise a radio frequency front end configured to receive a first radio signal and transmit a second radio signal. Tolonen teaches that the communication modules include the “[h]ardware ... **for the transmission and reception of signals**, ... includ[ing] components (e.g., electronics) that perform functions, such as modulation, demodulation, **amplification**, and **filtering**.” Ex. 1005 ¶ 59 (emphasis added); *see also*, *id.* ¶¶ 62-63 (explaining that wireless transmission is via radio modem). Although Tolonen does not use the term “RF Front End,” Tolonen’s communication modules—with the hardware for transmitting and receiving

signals—nevertheless, must include an “RF Front” end. Ex. 1003, ¶ 66. Indeed, every wireless communication system must have an RF Front end. *Id.* (citing Ex. 1011 at 7) (“[A]ll wireless systems can be decomposed into four subsystems [Antenna, RF Front-End, Baseband, and Controller].”). As represented by figure 6A below, Tolonen’s communication modules 310, 312, and 320 include antennas. Ex. 1005, Fig. 6A; *see also*, Ex. 1003 ¶ 67.



Ex. 1005, Fig. 6A (annotated).

Tolonen’s RF Front end is inherently electrically coupled to an ADC and a DAC, both of which are further coupled to Tolonen’s WDC 100’s system bus. In connection with Figure 6A above, Figure 6B below illustrates Tolonen’s communication modules as “radio modems.”

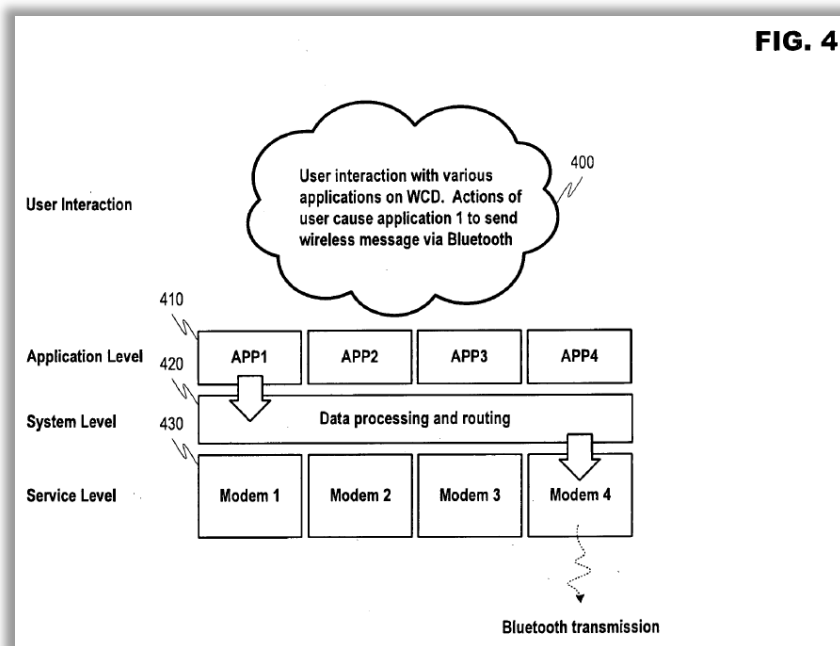


Ex. 1005, Fig. 6B (annotated).

Because radio Modems operate to, among other things, convert data from digital to analog for transmission across an RF Front end, Tolonen’s Radio Modems must include an analog to digital converter (“ADC”) and digital to analog converter (“DAC”). *See* Ex. 1005 ¶¶ 53–56, 59, 62, 65–66, Fig. 6A, 6B; Ex. 1003 ¶¶ 68, 74. For Tolonen’s radio modems to transmit communications through wireless transmission via radio frequency signals, it is a requirement that the communication modules first convert the digital data (received from the processor) to an analog signal by passing it through the DAC before the signal can be communicated through the RF Front end. *Id.* (explaining that radio transmission, including cellular transmission, works by taking digital data and converting it into an analog signal that can be communicated via radio-frequency waves); *see also*, Ex. 1005 ¶ 62. In

this way, Tolonen's ADCs and DACs must be electrically coupled to Tolonen's RF Front end. *See* Ex. 1003, ¶¶ 69-72 (explaining that Tuttlebee's long-range communication modules, which communicates according to GSM, necessarily includes an ADC and DAC coupled to the RF Front end).

The ADCs and DACs within Tolonen's communication modules are coupled to Tolonen's processor through a system bus. Tolonen teaches that the communication modules are coupled together with the WDC 100's processor (e.g., microprocessor), memory, close-proximity communication 340 (e.g., EIR device), and user interface "via one or more wired and/or wireless bus interfaces." Ex. 1005 ¶ 59. As further support, in connection with figure 4 below, Tolonen teaches that the "system level 420 may process and routes data requests for transmission, ... to an appropriate communication resource in the service level" and that "the packets may [then] be routed to a radio modem for delivery via wireless transmission." Ex. 1005 ¶ 62. In other words, Tolonen's processor executes data processing and transmits data to the communication modules through the system bus for transmission. *See* Ex. 1003, ¶ 75. Accordingly, Tolonen also inherently discloses that the ADC and DAC are connected to the system bus. *Id.*



Ex. 1005, Fig. 4.

As another example how Tolonen teaches this claim limitation, Tolonen’s long-range communication module communicates using “technologies from ... 3 G” and teaches using SDRs for these communication modules. Ex. 1005 ¶¶ 53, 89, 92. When implemented through SDR, 3 G chipsets included an RF Front end coupled to an ADC and a DAC, which were further coupled through a system bus to the processor running the SDR software. *See* Ex. 1003 ¶¶ 69-72, 77 (citing Ex. 1012, Figs. 1.4 and 1.5); *see also*, Ex. 1005 ¶¶ 89-98.

Finally, to the extent GSM could have been accomplished through a chipset with a different architecture, it would have been obvious to use an SDR GSM that included an ADC and DAC electrically coupled between the RF Front end and the processor because doing so would have amounted to selecting from a finite number

of identified solutions that would have yielded a reasonable expectation of success. Ex. 1003 ¶¶ 78-79. Indeed, Tolonen contemplates using SDRs for GSM communications, and a POSITA would have reasonably expected the combination to yield Tolonen's WDC with a long-range communication module according an SDR GSM chipset that included an ADC and DAC electrically coupled between the RF Front end and the processor. Ex. 1005, ¶¶ 89-98; Ex. 1003 ¶¶ 78-79.

(f) *1[E] Tolonen's "microprocessor is configured to execute at least one of a base-band encoder software program and a base-band decoder software program."*

Tolonen's processor 300 performs many of the functions for communicating via radio frequency, such as "modulation, demodulation, amplification, and filtering" as well as the functions for processing data including "calculat[ing], translat[ing], conver[ting], and/or packetizing the data" for transmission. Ex. 1005 ¶¶ 59-60, 62; *see also*, Ex. 1003 ¶ 80 (explaining that "packetizing" is "encoding" and "translating" and "converting" is "decoding"). And, as Tolonen contemplates encoding messages for security, the processing also pertains to encoding and decoding signals. Ex. 1005, ¶¶ 40, 54. Accordingly, Tolonen's processor includes a base-band encoder and decoder software program. Ex. 1003 ¶ 80.

- (g) *1[F] Tolonen's "base-band encoder software program is configured to produce a first encoded bit stream by performing at least one of the following functions: source encoding of a first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, and media access control."*

As described previously, Tolonen's processor (or microprocessors) performs functions in connection with transmitting and/or receiving encoded messages, including "modulation, demodulation, amplification, and filtering," as well as the functions for processing the data including "calculat[ing], translat[ing], conver[ting], and/or packetizing the data" for transmission. Ex. 1005 ¶¶ 59-60, 62; *see supra* Section V.A.1.f. These processes are examples of data encoding, which produces an encoded bit stream. Ex. 1003 ¶ 81. Additionally, Tolonen teaches that wireless communications are encoded for security. Ex. 1005 ¶¶ 40, 54.

- (h) *1[G] Tolonen's "DAC is configured to output to said radio frequency front end an analog signal corresponding to said first encoded bit stream."*

Tolonen's communications modules, which communicate packetized, encoded messages, include radio modems comprising an ADC and DAC, coupled to the communication modules' RF front end and to Tolonen's processor 300 via a bus. *Supra* Section V.A.1.e–g. For Tolonen's radio modems to transmit encoded communications via radio frequency signals, the communication modules must first convert the encoded digital data to analogue through the DAC. Ex. 1005 ¶ 82 (explaining that radio transmission, including cellular transmission, works by taking

digital data and converting it into an analog signal that can be communicated via radio-frequency waves). Accordingly, Tolonen, at least inherently, discloses a DAC that outputs an analog signal corresponding to said first encoded bit stream. Ex. 1005 ¶¶ 65–66; Ex. 1003. ¶ 82. Additionally, Tolonen teaches that wireless communications are encoded for security. Ex. 1005 ¶¶ 40, 54.

- (i) *1[H] Tolonen’s “ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said radio frequency front end.”*

Complementing the DAC functionality, for Tolonen’s WDC 100 to receive and process radio frequency communications—including packetized, encoded communications, Tolonen’s communication modules must include an ADC that converts the received analog signal into an encoded digital signal that can be processed by Tolonen’s processor 300. Ex 1003 ¶ 79; *see also, supra* Section V.A.1.e–h. Moreover, as Tolonen communicating via encoded messages, the received analog signal converted by the ADC would, at least inherently, yield an encoded digital signal. Ex. 1003 ¶ 83; *see also*, Ex. 1005 ¶¶ 40, 54 (encoding communications for security); *supra* Section V.A.1.e–h.

- (j) 1[I] Tolonen’s “base-band decoder software program is configured to produce a second bit stream corresponding to said second encoded bit stream by performing at least one of the following functions: media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding.”

In the same way that Tolonen’s WDC 100 comprises a processor and communication modules (including all the requisite hardware and software) for sending encoded, long-range communications, Tolonen’s WDC 100 also includes the information to unpack and interpret the communications received. *See supra* Section V.A.1.e–i. This means that upon receipt and conversion from analog to digital, Tolonen’s processor 300 executes software that decodes the received message (i.e., *the second encoded bit stream*) into a decoded message (i.e., *second bit stream corresponding to said second encoded bit stream*). Ex. 1003 ¶ 84. Again, Tolonen teaches the processor provides the “communication utilities for supporting long-range communications”—including “modulation, demodulation, amplification, and filtering,” as well as the functions for processing the data including “calculat[ing], translat[ing], conver[ting], and/or packetizing the data”—and that communications are encoded for security. Ex. 1005 ¶¶ 40, 54, 59–62. In this way, Tolonen, at least inherently teaches this limitation. Ex. 1003 ¶ 84.

2. Claim 2

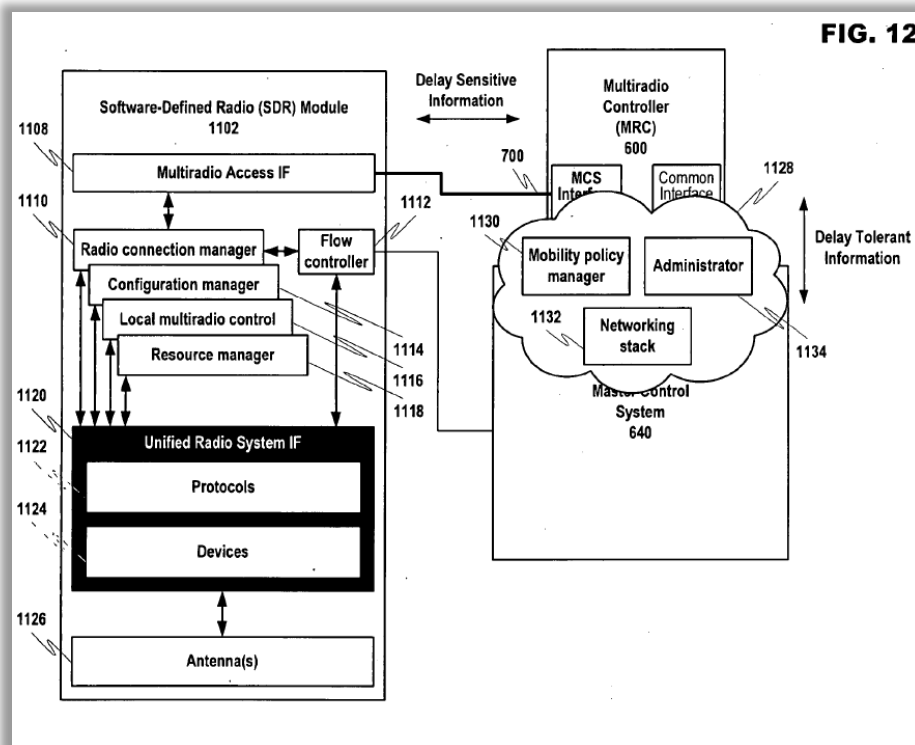
- (a) *Tolonen's "[t]he EIR terminal of claim 1 is devoid of dedicated hardware components configured to implement at least one of the following functions: source encoding of said first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding."*

For example, Tolonen teaches that the “components (e.g., electronics) that perform functions, such as modulation, demodulation, amplification, and filtering” “may be replaced by integrated circuits ... that may be programmed to replicate the functions of the stand-alone devices.” Ex. 1005 ¶ 59. Additionally, Tolonen contemplates that any hardware-based radio module, communication modules 310, 320, 330, and 340, may optionally be replaced with “radio modules that rely more heavily upon a reconfigurable software-based element”—“a software-defined radio.” Ex. 1005 ¶ 89–91. Finally, Tolonen teaches the processor (e.g., running software) processes the data including “calculat[ing], translat[ing], conver[ting], and/or packetizing the data”—and that communications are encoded for security. Ex. 1005 ¶¶ 59–62; *see also*, Ex. 1003 ¶ 85.

3. Claim 3

- (a) Tolonen's "EIR terminal of claim 1[] further compris[es] a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol."

Where Tolonen's hardware radio modems are replaced with a software-defined radio ("SDR"), the SDRs receive data instructing on rules and preferences for the communication medium (e.g., the *wireless communication network*, *wireless communication protocol*, and *parameters of the wireless communication protocol*).

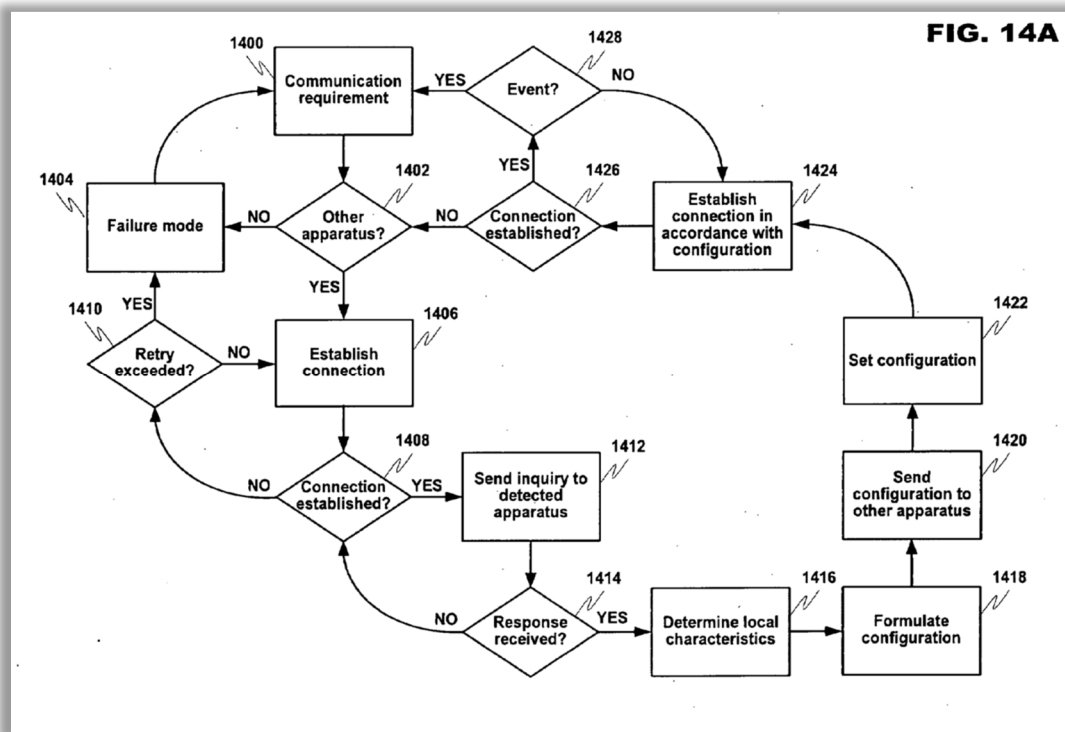


Ex. 1005, Fig. 12.

With reference to figure 12, Tolonen teaches that the SDR includes a radio connection manager 1110 that receives “instruction information (e.g., rules or preferences regarding which transports to utilized in certain situations)” from program modules 1128 residing within Tolonen’s Multiradio Controller (“MRC”) 600. Ex. 1005 ¶¶ 94–98. Tolonen teaches that “[t]hese preferences and/or rules may be based on various apparatus, application or user-defined characteristics,” for example, “the number of messages pending for each transport in [the] networking stack.” Ex. 1005 ¶ 98. Tolonen teaches that, with this data, the radio connection manager 1110 configures the SDR “to support the particular wireless transport,” and the SDR’s local multiradio control 1116 implements the configuration. *Id.* ¶ 95; *see also, id.* ¶ 70 (delivering delay tolerant information such as configuration information “by master control system 640”), ¶¶ 74–75 (teaching that priority controller 740 of MRC 700 may be implemented in software running on processor 300 within master control system 640 to determine priority amongst radio modems, i.e., *to dynamically select a wireless communication network*). Tolonen’s SDR can then “emulate [the] desired radio function.” Ex. 1005 ¶ 96. For example, by “access[ing] and/or manipulating” protocols 1122 and device information 1124, Tolonen’s SDR can “emulate the functionality of a radio module that is configured to operate using a first transport (e.g., Bluetooth ...).” *Id.* ¶ 96.

Tolonen teaches that this configuration happens dynamically. For one, Tolonen teaches that “mobility policy manager 1130 may work with administrator 1134 to create an appropriate implementation schedules so that communication may continue within the guidelines set forth in the preferences and/or rules.” Ex. 1005 ¶ 98. In another way, Tolonen teaches that the SDR module has “cognitive features,” such that “[c]haracteristics like apparatus status (e.g., process load, pending messages, power condition, etc.) and the environment proximate to an apparatus may be utilized to configure SDR module 1102.” *Id.* ¶ 97.

Tolonen teaches that “resources in SDR module 1102, another radio module, or elsewhere in WCD 100 may be able to identify signals that could potentially interfere with apparatus communication” and “schedule communication in a multiradio system.” *Id.* As illustrated in Figure 14A below, Tolonen teaches that “in various embodiments ... the communication may continue in accordance with the existing configuration until an event occurs that would necessitate a new configuration,”: “fulfillment of the communication requirement, a loss of wireless connection between the apparatuses, sensed interference in proximity to either apparatus, a higher priority communication in one or both of the apparatuses that could conflict with current communication.” Ex. 1005 ¶ 104; *see also*, Fig. 14A.



Ex. 1005, Fig. 14A.

4. Claim 4

- (a) Tolonen's "EIR terminal of claim 1, further compris[es] a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol."

Claim limitation 4[A] is identical to Claim 3. Accordingly, Tolonen teaches limitation 4[A] for the same reasons. *See supra* Section V.A.4.

- (b) *Tolonen discloses “wherein said value of said user-defined criterion is calculated based on at least one of network status, communication quality, signal strength, service cost, bandwidth, a user preference, and communication channel throughput.”*

To implement a particular radio configuration, Tolonen’s SDR 1102 receives data from MCS 700 indicating “rules or preferences regarding which transports to utilize in certain situations.” Ex. 1005 ¶ 95; *see supra* Section V.A.4. Tolonen’s “preferences and/or rules may be based on various apparatus, application or ***user-defined characteristics***” set by the mobility policy manager 1130. Ex. 1005 ¶ 98. In addition to user preferences, Tolonen also teaches that when two devices are in communication with one another, characteristics may define the configuration of the SDR, which include “channel selection for each transport ..., error correction, Quality of Service (QoS) requirements, operational schemes (e.g., power saving, high speed, etc.), radio module priority (for conflict resolution), etc.” *Id.* ¶ 102; *see also, id.* ¶ 104 (teaching that communications continue in accordance with the set, existing configuration until an event occurs that necessitates a new configuration).

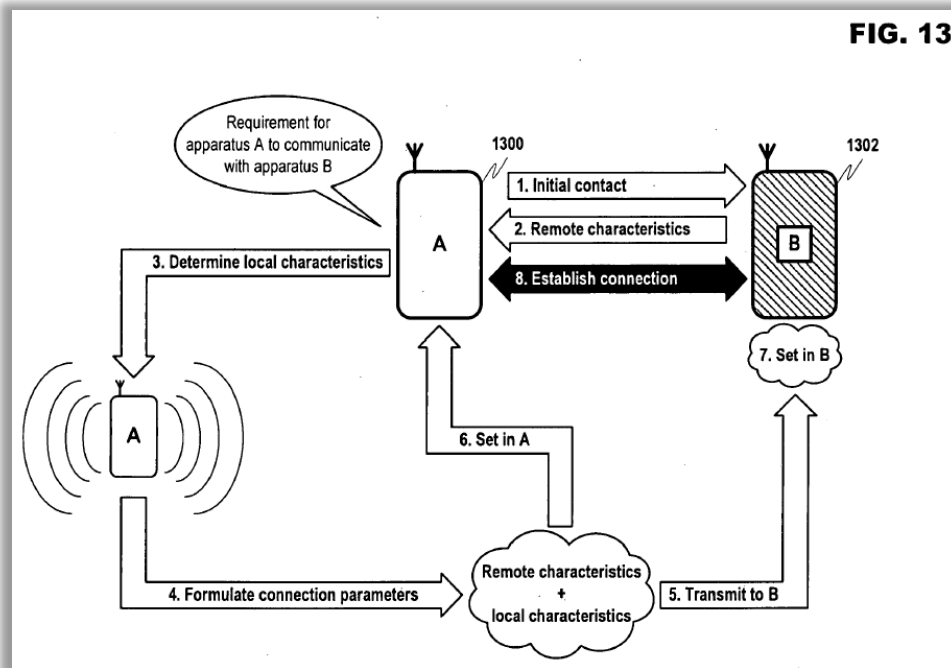
5. Claim 5

- (a) Tolonen's "[t]he EIR terminal of claim 1, further compris[es] a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol."

Claim limitation 5[A] is identical to Claim 3. Accordingly, Tolonen teaches limitation 5[A] for the same reasons. *See supra* Section V.A.4.

- (b) Tolonen discloses "wherein said EIR terminal is configured to search beacon signals over a pre-defined frequency range, and then select at least one of a wireless communication network and frequency channel which optimizes said user-defined criterion."

In Figure 13 below, Tolonen describes a scenario where a first device establishes a connection with a second device. Ex. 1005 ¶ 100.



Ex. 1005, Fig. 13.

For this scenario, Tolonen teaches that “apparatus A 1300 may send a wireless inquiry to apparatus B 1302 ... for example, utilizing a channel (e.g., an initialization channel that is known to (e.g., predefined or predetermined) each apparatus.” Ex. 1005 ¶ 101. From there, the first device determines “remote characteristics”—information relating to the second device’s “status and/or environmental conditions proximate to the second device”—and local characteristics—same as the remote characteristics but pertaining to itself. *Id.* ¶¶ 101–102. Finally, “ha[ving] both the remote and local characteristic information, a configuration for SDR module 1102 may be formulated,” including by “defin[ing] a transport, ... channel selection ..., error correction, Quality of Service (QoS)

requirements, operational schemes (e.g., power saving, high speed, etc.), [and] radio module priority.” *Id.* ¶ 102.

In another example, rather than communicating between two predetermined devices, Tolonen describes finding a device to connect to. In this example, Tolonen’s first device searches for second devices, or apparatuses, to connect to. Ex. 1005 ¶ 105. Ex. 1003 ¶ 93 (discussing that Bluetooth and WLAN devices transmit beacon signals in their respective frequency ranges waiting for a recipient device to accept the signals). For this example, Tolonen’s “process may begin ... with the realization of a communication requirement in an apparatus.” *Id.* “A determination [is] ... made ... as to whether any other apparatuses that can fulfill the [device’s] requirement are within communication range of the apparatus.” *Id.* Then, “[i]f at least one other apparatus that can fulfill the communication requirement is detected within range of the apparatus, ... a connection request may be sent to the other apparatus” and the remote characteristics and local characteristics used to establish the connection configuration. *Id.* ¶¶ 105–06; *see also, id.* ¶ 78 (describing scheduling around a “targeted beacon transmission time in WLAN (100 ms)). In this way, Tolonen is operable to communicate a beacon signal at a predefined frequency and select the wireless transport (*i.e.*, wireless communication network and frequency channel) which optimizes said user-defined criterion. Ex. 1003 ¶ 93.

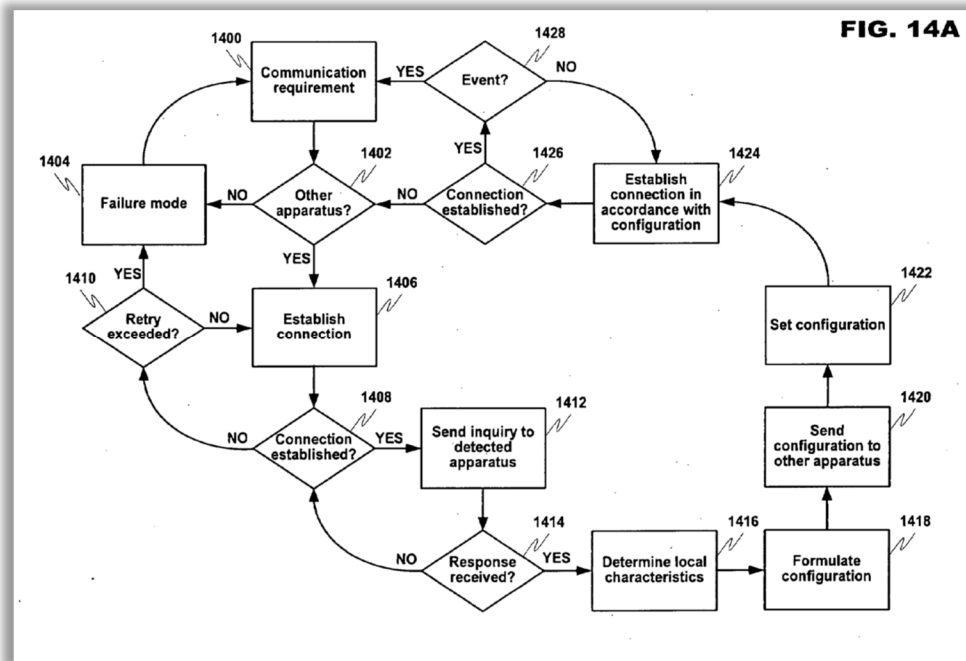
6. Claim 6

- (a) *Tolonen discloses “[t]he EIR terminal of claim 1, further comprising a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol.”*

Claim limitation 6[A] is identical to Claim 3. Accordingly, Tolonen teaches limitation 6[A] for the same reasons. *See supra* Section V.A.4.

- (b) *Tolonen discloses “wherein said EIR terminal is configured to switch at least one of said wireless communication network and said wireless communication protocol responsive to evaluating said user-defined criterion.”*

Tolonen recognizes signal interference issues arise when communicating using multiple communication protocols (e.g., Bluetooth, WLAN, and wireless USB). Ex. 1005, ¶¶ 63–64. To remedy the interference, Tolonen teaches that the “[multiradio controller] may schedule communication in a multiradio system.” Ex. 1005 ¶ 97. Tolonen also contemplates switching communications mid-transmission. Tolonen’s figure 14 illustrates a process by which a communication apparatus defines a new communication configuration whenever an event, (e.g., “a loss of wireless connection between the apparatuses ... [or] a status change in either apparatus (e.g., power deletion)) necessitates a change. *Id.* ¶ 104.



Ex. 1005, Fig. 14.

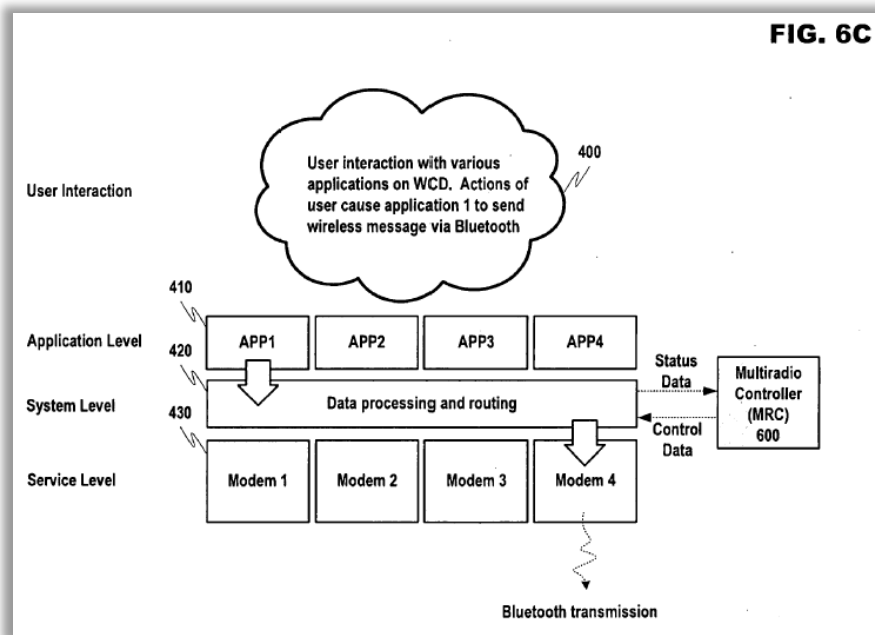
7. Claim 7

- (a) Tolonen's "EIR terminal of claim 1, [is] further configured to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol responsive to a user action."

As one example, Tolonen teaches that a "user coming within effective transmission range of a Bluetooth, WLAN, UWB, WUSB, etc. access point" may cause "a network ... [to] automatically be established to transmit information to WCD 100 possessed by user 110." Ex. 1005 ¶ 42. In this example, the user action is the user moving into range.

Additionally, Tolonen teaches that the user's interaction with the interface determines what communication modules, and, thus, what protocols, are employed.

Ex. 1005 ¶¶ 48–49, 67, Fig. 6C. When a user enters data into Tolonen’s WCD, through user interface module 240, the “data ... may be interpreted by control module 210 to affect the behavior of WCD 100.” *Id.* ¶ 48. For example, Tolonen’s applications module 250 may be “invoked by control module 210 to read information provided by the various modules, and in turn, may supply information to requesting modules in WCD 100.” *Id.* ¶ 49. As shown in Figure 6C below, Tolonen’s master radio controller (“MRC”) 600 uses, in part, information about the “applications running in application level 410” to “issue scheduling commands to the communication devices in service level 430.” *Id.* ¶ 67.



Ex. 1005, Fig. 6C.

In this way, the user’s interaction with the WCD 100, including inputting information and/or choosing the application to operate, causes the WCD to select

the appropriate wireless communication protocol or the parameters thereof. Ex. 1005, Fig. 6C (“User interaction with various applications on WCD. Actions of user cause application 1 to send wireless message via Bluetooth.”); Ex. 1003 ¶¶ 99-101.

8. Claim 8

- (a) *Tolonen’s “EIR terminal of claim 1, [is] further configured to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol responsive to scanning a pre-defined bar code.”*

As described above for claim 7, a user interacting with various application in the WCD 100 causes the WCD 100 to determine the wireless communication protocol or parameter. *Supra* Section V.A.8; *see also*, Ex. 1005 Fig. 6C. Moreover, as Tolonen teaches using close-proximity communications 240, such as “scanning methods for reading machine-readable data” such as “IR communication, linear and 2-D (e.g., QR) bar code readers (including processes related to interpreting UPC labels), the user interacting with the bar-code scanning application would cause the WCD 100 to determine a wireless communication protocol. Ex. 1005 ¶ 56; Ex. 1003 ¶¶ 102-03.

Nevertheless, to the extent Tolonen does not expressly connect these dots, a POSITA would have found the functionality inherent or obvious over Tolonen’s disclosures. Ex. 1003 ¶¶ 102-03. For example, a POSITA would have realized that because Tolonen’s WCD 100 includes a bar-code scanner (e.g., close proximity

communications 100) and is operable to dynamically select different communication protocols, e.g., Bluetooth, cellular, WiFi, etc., it would have been an obvious and straightforward application to dynamically select one of these protocols in response to scanning a bar code. *Id.* ¶ 98-99.

9. Claims 9-14

Independent Claim 9 shares the same preamble and first-six claim limitations as claim 1 (e.g., 1[pre]-[E]). Claim 9 additionally incorporates claim 3. Accordingly, claim 9 is anticipated by Tolonen for the same reasons set forth for claims 1 and 3 above.

Dependent claims 10 through 14 depend from claim 9, but otherwise are identical to claims 4 through 8. Accordingly, claims 10 through 14 are anticipated by Tolonen for the same reasons set forth for claims 1, 3-8.

10. Claim 15

Claim 15 is comprised of a preamble and six claim limitations—all of which are disclosed by Tolonen as analyzed above. Specifically, claim 15 and claim 1 have the same preamble; claim limitations 15[A]–[E] are identical to claim limitations 1[A]–[E], and limitation 15[F] is substantively identical to claim 8.¹

¹ Claim 8 recites “responsive to scanning a pre-defined barcode”; whereas, claim 15 recites “responsive to at least one of a user action, scanning a pre-defined bar code.”

11. Claim 16

- (a) *Tolonen's "base-band encoder software program is performed by at least one of a general-purpose microprocessor, a specialized microprocessor."*

Tolonen's memory includes "specialized software modules configured to manage particular functions such as communication sections." Ex. 1005 ¶ 52. Specialized functionality such as "calculat[ing], translat[ing], conver[ting], and/or packetizing the data" exists in the memory. *Id.* ¶¶ 52, 62; Ex. 1003 ¶ 111 (describing that software to packetize information exists on the memory and is executed by a processor). Although Tolonen's processor is configured to execute base-band encoder software program, *see supra* Section V.A.1.b, e–i, Tolonen also alternatively describes a processor implementation "utilizing one or more microprocessors that are each capable of executing software instructions stored in memory." Ex. 1005 ¶ 50. To create a more efficient system architecture, Tolonen's processor would "control overall device operation" while delegating specific communication module functionality, such as base-band encoding software stored on the memory, to a microprocessor. *Id.* ¶¶ 50, 52; Ex. 1003 ¶ 111 (explaining that microprocessors are often used in conjunction with a processor to allow more specialized software to run on architecture better suited for its needs); *cf.* '784 Patent, 6:25–32 ("A skilled artisan would appreciate the fact that different schemes of processing tasks distribution among the two or more microprocessors are within the

spirit and the scope of the invention.”). Therefore, Tolonen, at least inherently, discloses a base-band encoding software program is performed by at least one of a general-purpose or specialized microprocessor. Ex. 1003 ¶ 111.

12. Claim 17

- (a) *Tolonen’s base-band decoder software program is performed by at least one of a general purpose microprocessor, a specialized microprocessor.*

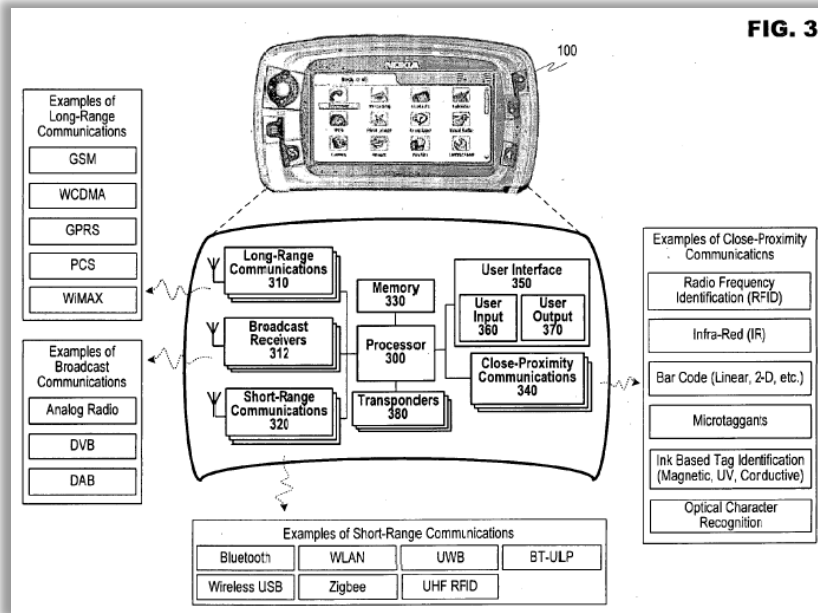
Analogous to a base-band encoder software program being performed on a microprocessor, Tolonen’s specialized software also includes base-band decoder software stored on the memory. Ex. 1005 ¶ 52; *see supra* Section V.A.12. Again, Tolonen describes a processor implementation “utilizing one or more microprocessors that are each capable of executing software instructions stored in memory”—software instructions including specific communication module functionality, such as base-band encoding software. *Id.* ¶ 50. Since Tolonen’s processor is configured to “control overall device operation” while delegating specific communication module functionality, such as base-band decoding software stored on the memory, to a microprocessor, Tolonen, at least inherently, discloses a base-band decoding software program performed by at least one of a general-purpose or specialized microprocessor. *Id.* ¶¶ 50, 52; Ex. 1003 ¶ 112; *supra* Section V.A.12.

13. Claim 18

Claim 18 is comprised of a preamble and five claim limitations—all of which are disclosed by Tolonen as analyzed above. Specifically, claim 18 and claim 1 have the same preamble; claim limitations 18[A]–[C] are identical to claim limitations 1[A]–[C]; and claim limitation 18[E] is identical to claim 3. Only claim limitation 18[D] is separate and unique from prior analyzed claim limitations. Accordingly, Tolonen teaches Claim 18 for the same reasons. *See supra* Sections V.A.1, VI.A.3. This section will only discuss claim limitation 18[D].

(a) *Tolonen discloses 18[D], “a wireless communication interface configured to support at least two wireless communication protocols.”*

As shown in figure in figure 3 below, Tolonen’s WDC 100 includes different communication modules (*i.e., wireless communication interfaces*), for example, long-range communications 310 and short-range communications 320. Ex. 1005 ¶ 50, Fig. 3; *see also, supra* Section V.1.e (describing how each of these interfaces include the components of an RF front end). Each of these wireless communication interfaces support at least two-different communication protocols. For example, the short-range communication module supports at least Bluetooth and WLAN. Ex. 1005 ¶ 55.



Ex. 1005, Fig. 3.

Additionally, Tolonen teaches that any of these communication modules (interfaces) can be substituted with a software defined radio (“SDR”). Ex. 1005 ¶ 89. Tolonen teaches that SDRs that “rely more heavily upon a reconfigurable software-based element ... may be reconfigured at runtime, and therefore, these radio modules may be reconfigured to emulate various functionality that was traditionally only available through discrete modules.” *Id.* Tolonen teaches that SDR allows for a single platform to implement different wireless connectivity features, such that the “radio programs may serve the purpose of cellular communication, local connectivity, broadcast, etc.” *Id.* ¶¶ 89-93; *see also, supra* Section V.3 (describing Tolonen’s teaching about the SDR dynamically switching between communication protocols).

14. Claim 19

- (a) *Tolonen discloses “[t]he EIR terminal of claim 18, wherein said wireless communication interface is implemented using a single multi-protocol chipset.”*

As discussed for claim 18, Tolonen’s communication modules may be substituted with an SDR, which supports runtime configuration of different communication protocols. *See supra* Section V.14 (citing Ex. 1005 ¶¶ 89-93). Tolonen also teaches that for the communication modules, “any or all individual components may be replaced by integrated circuits in the form of a programmable logic device, gate array, ASIC, multi-chip module, etc. that may be programmed to replicate the functions of the stand-alone devices.” Ex. 1005 ¶ 59.

15. Claim 20

- (a) *Tolonen discloses “[t]he EIR terminal of claim 18, wherein said wireless communication interface is implemented using two or more chipsets.”*

As discussed for claim 18, Tolonen’s communication modules may be substituted with an SDR, which supports runtime configuration of different communication protocols. *See supra* Section V.15 (citing Ex. 1005 ¶¶ 89–93). Tolonen also teaches that for the communication modules, “any or all individual components may be replaced by integrated circuits in the form of a programmable logic device, gate array, ASIC, multi-chip module, etc. that may be programmed to replicate the functions of the stand-alone devices.” Ex. 1005 ¶ 59.

16. Claims 21-23.

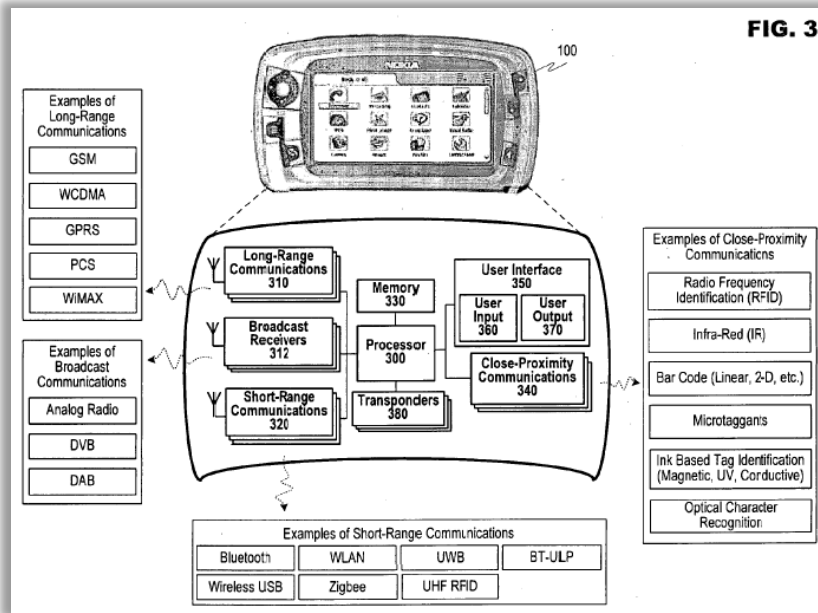
Dependent claims 21 to 23 are identical to claims 4 to 6, except that claims 21 to 23 depend from claim 18. Accordingly, claims 21 to 23 are anticipated by Tolonen for the same reasons set forth for claims 4 through 6 and 18.

VI. GROUND 2: Obviousness of Claims 1–23 over Tolonen in view of Katz.

A. Motivation to Combine

A POSITA would have been motivated to combine Tolonen with Katz. Ex. 1003 ¶¶ 121-129. Tolonen teaches a wireless communication device (“WDC”) that comprises different communication modules, such as close-proximity, short-range, and long-range communications, and Katz provides the specific details behind those modules’ hardware configurations. Accordingly, combining Tolonen with Katz would have constituted combining prior art elements according to known methods to yield predictable results; would have constituted a simple substitution of one known element for another to obtain predictable results; and/or would have constituted choosing from a finite number of identified, predictable solutions, with a reasonable expectation of success. *See* MPEP § 2143.I; *see also*, Ex. 1003 ¶¶ 122, 128-29.

As shown in figure 3, below, Tolonen describes a WDC that includes communication sections 310, 312, 320, and 340, corresponding to long-range, broadcast, short-range, and close-proximity, respectively.



Ex. 1005, Fig. 3.

Tolonen teaches that “[l]ong-range communications 310 may manage functionality related to the wireless exchange of information over large geographic areas (such as cellular networks) via an antenna” (e.g. through “1 G to 3 G”). Ex. 1005 ¶ 52. Tolonen teaches that “[s]hort-range communications 320 is responsible for functions involving the exchange of information across short-range wireless networks” (e.g., “Bluetooth, WLAN,” etc.). Ex. 1005 ¶ 55. Tolonen also teaches that “[c]lose proximity communications 340 may provide functionality related to the short-range scanning of machine readable data” (e.g., RFID, bar code reading, etc.). Ex. 1005 ¶ 56.

Tolonen further teaches that the “[h]ardware corresponding to communications sections 310, 312, 320 and 340 provide for the transmission and

reception of signals” and teaches that “these portions may include components (e.g., electronics) that perform functions, such as modulation, demodulation, amplification, and filtering.” Ex. 1005 ¶ 59. However, to the extent Tolonen does not describe the hardware in exact detail, Katz does.

Katz describes a Blackfin processor that is operable to control the different functionalities of a software defined RFID reader. *See, generally*, Ex. 1006. As part of its background, Katz generally describes the hardware common to RFID readers and other communication modules. For example, Katz describes a mixed-signal front-end for communication with a transponder. As shown in the image below, Katz’s example mixed-signal front-end, which is designed to “cover the mixed-signal front end needs of multiple wireless communication systems” includes the hardware components of an RF front end. Ex. 1006 at 3; *see also*, Ex. 1009, AD9861 Data Sheet at 22.

Figure 2 shows a block diagram of a typical MxFE device.

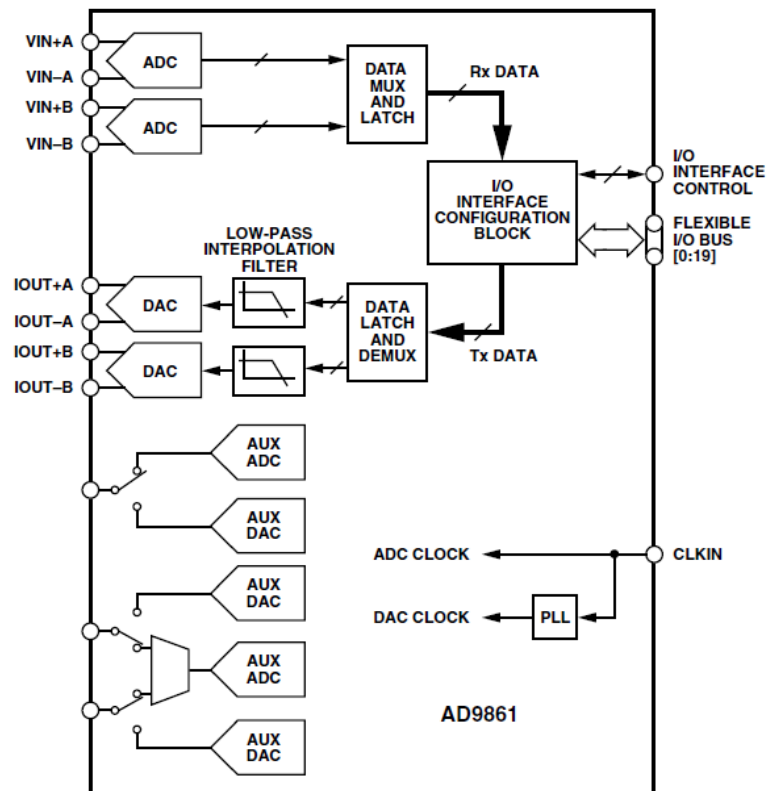


Figure 2. Block diagram of a representative MxFE IC, the AD9861.

Ex. 1006, Fig. 2.

To the extent a POSITA reading Tolonen needed to find and implement hardware components corresponding to Tolonen’s communication sections (also referred to as “communication modules”), the POSITA would have looked to Katz to supply the details. Ex. 1003 ¶ 127. Indeed, Katz regularly cites and incorporates data sheets of various RF Front ends and processors capable of performing the functions described by Tolonen. *Id.*

A POSITA would have combined Tolonen with Katz according to known method and would have realized predictable results. Ex. 1003 ¶ 128. For example, a

POSITA would have known that Tolonen's communication modules 310, 312, 320, and 340 each require an RF Front End and would have simply chosen to use the AD9861 mixed-signal front end ("MxFE") described by Katz. *Id.* And, because Katz's MxFE includes as the components needed to communicate according to radio frequency signals, the POSITA would have realized the predictable results of Katz's MxFE communicating with radio frequency signals according to both Tolonen's and Katz's teachings. *Id.* ¶¶ 124-25 (explaining also that a POSITA would have known that Tolonen's processor 300 and memory 330 would easily have been swapped for Katz's Blackfin processor and memory). Finally, because Tolonen and Katz both describe multiprotocol communication interfaces (e.g., Tolonen's communication modules and Katz's MxFE) the POSITA would have had a reasonable expectation that Katz's mixed-signal front end would accomplish the communication goals set forth in Tolonen. *Id.*

B. Tolonen in view of Katz Invalidates the Claims

As just discussed, where Tolonen's communication interface is implemented using Katz's RF Front End, a POSITA would have combined Tolonen with Katz to arrive at Tolonen's WDC. Accordingly, the discussion that follows specifically maps limitations 1[D] through 1[J], claims 2, 18-20. Nevertheless, to implement Katz's RF Front end, it would also have been obvious to a POSITA to include or substitute

Katz's blackfin processor and memory into Tolonen's WDC, claims 1[A]-1[B]. *See* Ex. 1003 ¶¶ 131-32.

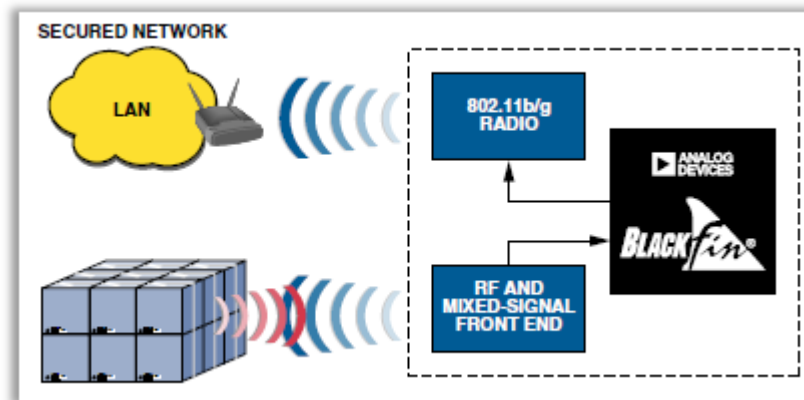
1. Claim 1

- (a) *1[D] Tolonen in view of Katz discloses "a wireless communication interface comprising a radio frequency front end configured to perform at least one of receiving a first radio signal and transmitting a second radio signal, said radio frequency front end electrically coupled to at least one of an analog-to-digital converter (ADC) electrically coupled to said system bus and a digital-to-analog converter (DAC) electrically coupled to said system bus."*

As set forth above for claim limitation 1[D], *see supra* Section V.A.1.e, Tolonen discloses communication modules 310, 312, 320 ("communication modules") that transmit and receive radio signals. Ex. 1005 ¶ 59. Tolonen also teaches that the communication modules include the "[h]ardware ... *for the transmission and reception of signals*, ... includ[ing] components (e.g., electronics) that perform functions, such as modulation, demodulation, *amplification*, and *filtering*." Ex. 1005 ¶ 59. However, to the extent Tolonen does not expressly describe these features, a POSITA would have looked to Katz to provide these specifics. Ex. 1003 ¶ 133.

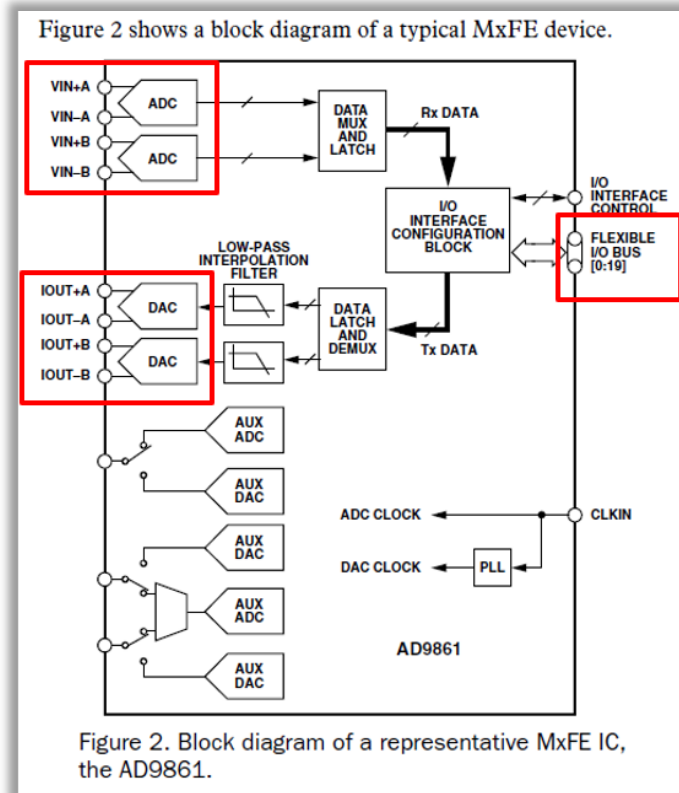
Like Tolonen, Katz discloses an RFID Reader that includes different communication modules. Katz explains that RFID readers "provide[] the connectivity between individual tags and the tracking/management system" by

providing “three main functions: bidirectional communication with the tags ... ; initial processing of received information; and connection to the server that links the information into the enterprise.” Ex. 1006 at 1–2. Accordingly, as shown in figure 5 below, Katz discloses an RFID Reader that includes both an “RF and Mixed-Signal Front End” (*i.e.*, *wireless communication interface*) coupled to a blackfin processor, which is further coupled to an 802.11b/g Radio chipset.



Ex. 1006, Fig. 5.

For its RF and Mixed-Signal Front End, for example, Katz describes Analog’s MxFE. Ex. 1006 at 3. For example, Katz explains that the MxFE allows the RFID reader to communicate with RFID Transponders (“Tags”), which Katz explains happens through sending and receiving “radio-frequency (RF) transmissions of bit streams.” Ex. 1006 at 1–3; *see also* Fig. 1. As shown in Katz’s figure 2, below, Katz’s MxFE includes ADCs and DACs which are electrically coupled to the RF Front out (e.g., VIN and IOUT), and coupled to the I/O Bus.



Ex. 1006, Fig. 2 (annotated).

With specific regards to the bus the ADC and DAC connect to, Katz teaches the processors “include[s] a *parallel peripheral interface* (PPI), which can connect directly to ADCs and DACs.” Ex. 1006 at 3. Katz teaches that when “the PPI is configured in *transmit* mode, ... the processor sends a digital sequence to a DAC,” and “[t]he transmitted sequence is converted to an analog signal, which is then upconverted and sent out to excite/wake up local RFID tags, which then respond.” Katz further teaches that when “the PPI is reconfigured as a receiver in a small number of processor system clock pulses” such that “the downconverted RF signal can be sampled by an ADC and brought into the Blackfin directly.” Ex. 1006 at 3.

(b) *1[E] Tolonen in view of Katz discloses “wherein said microprocessor is configured to execute at least one of a base-band encoder software program and a base-band decoder software program.”*

Tolonen discloses a wireless communication device with a processor “control[ling] overall device operation.” Ex. 1005 ¶ 50. In the same way, Katz discloses Analog’s blackfin processor. To implement Katz’s RF Front end, it would have been obvious to a POSITA to implement or substitute Katz’s baseband encoding software and/or Blackfin Processor for Tolonen’s. Ex. 1003 ¶¶ 128-29, 127. Katz teaches that “reader[s] ha[ve] embedded software that manage[] the interrogation, decoding, and processing of ... received tag information; and it communicates with a storage system that houses a tag database and other relevant information.” Ex. 1006 at 1. For example, Katz explains that the blackfin processor is operable to operate the “three elements of the RFID reader software architecture ...: the *back-end server interface*, the *middleware*, and the *front-end tag reader algorithms*.” Ex. 1006 at 2 (emphasis in original). Katz teaches that the processor performs the front-end filtering and transformative signal processing. Ex. 1006 at 3; Ex. 1003 ¶¶ 137-38 (explaining that signal processing and transformation thereof is the requisite software functionality to packetize or *encode* information). In its disclosure, Katz incorporates by reference Analog’s ADSP-BF531 Blackfin processor data sheet, which explains that “[t]he processor provides a parallel peripheral interface (PPI) that can connect directly to parallel A/D and D/A

converters, ITU-R 601/656 video encoders and decoders, and other general-purpose peripherals.” Ex. 1007, ADSP-BF531 Data Sheet, at 11.

- (c) *1[F] Tolonen in view of Katz’s “base-band encoder software program is configured to produce a first encoded bit stream by performing at least one of the following functions: source encoding of a first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, and media access control.”*

To implement Katz’s RF Front end, it would have been obvious to a POSITA to implement or substitute Katz’s baseband encoding software and/or Blackfin Processor for Tolonen’s. Ex. 1003 ¶¶ 128-29, 131, 139. Katz’s blackfin processor implements software that operates the “time-division multiplexing algorithm,” which is designed to avoid collisions in a multiple reader/tag scenario. Ex. 1006 at 2. As another example, as discussed in the previous limitation, Katz’s Blackfin processor is operable to run the front-end software, middleware software, and backend software, including by performing the “system’s filter- and transform-intensive signal processing, occurring in the front end.” Ex. 1006 at 2–3; *see supra* Section V.A.1.g; *see also* Ex. 1003 ¶¶ 140-41 (explaining that the filter- and transform-intensive signal processing at the front end includes at least frequency spreading, multiplexing, and modulation because this is how the front end communicates with different radio signal receivers).

- (d) *1[G] Katz's "DAC is configured to output to said radio frequency front end an analog signal corresponding to said first encoded bit stream."*

For example, Katz explains that when "the PPI is configured in transmit mode, ... the processor sends a digital sequence to a DAC" and "[t]he transmitted sequence is converted to an analog signal, which is then upconverted and sent out to excite/wake up local RFID tags, which then respond." Ex. 1006 at 3.

- (e) *1[H] Katz's "ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said radio frequency front end."*

For example, Katz teaches that when "the PPI is reconfigured as a receiver ... [a] downconverted RF signal can be sampled by an ADC and brought into the Blackfin [processor] directly." Ex. 1006 at 3.

- (f) *1[I] Tolonen in view of Katz's "base-band decoder software program is configured to produce a second bit stream corresponding to said second encoded bit stream by performing at least one of the following functions: media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding."*

To implement Katz's RF Front end, it would have been obvious to a POSITA to implement or substitute Katz's baseband encoding software and/or Blackfin Processor for Tolonen's. Ex. 1003 ¶¶ 128-29, 131. Katz teaches that RFID readers rely on software for "manag[ing] the interrogation, *decoding*, and processing of the received tag information." Ex. 1006 at 1. Katz further teaches that this software performs "the front-end tag reader algorithms," which includes "time-division

multiplexing,”—for example to avoid collisions from multiple RFID readers attempting to read information from multiple tags. Ex. 1006 at 2. A person having ordinary skill in the art would recognize that software that utilizes time-division multiplexing when prompting tags must also include software time-division *de-multiplexing* to understand the information sent by the tags. Ex. 1003 ¶ 139. When Katz’s blackfin processor receives the “downconverted RF signal ... sampled by an ADC” that signal must therefore be demultiplexed and decoded for processing. *Id.*

2. Claim 2

- (a) *Tolonen in view of Katz discloses “[t]he EIR terminal of claim 1, wherein said EIR terminal is devoid of dedicated hardware components configured to implement at least one of the following functions: source encoding of said first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding.”*

To implement Katz’s RF Front end, it would have been obvious to a POSITA to implement or substitute Katz’s baseband encoding software and/or Blackfin Processor for Tolonen’s. Ex. 1003 ¶¶ 128-29, 131. For example, Katz notes that RFID readers “ha[ve] embedded software that manages the interrogation, decoding, and processing of the received tag information” and explains that there are “three elements” of this RFID reader software: “the back-end server interface, the middleware, and the front-end tag reader algorithms.” Ex. 1006 at 1-2. At least one

of the tag reader algorithms performs “*time-division multiplexing*.” Because “all of these [distinct] elements ... concurrently” run on the Blackfin processor and the time-division multiplexing occurs exclusively in the software, the wireless communication device disclosed by Tolonen in view of Katz is devoid of *dedicated hardware components* configured to implement at least time-division *multiplexing*.

3. Claim 18

Claim 18 is comprised of a preamble and five claim limitations—all of which are disclosed by Tolonen as analyzed above. Specifically, claim 18 and claim 1 have the same preamble; claim limitations 18[A]–[C] are identical to claim limitations 1[A]–[C]; and claim limitation 18[E] is identical to claim 3. Only claim limitation 18[D] is separate and unique from prior analyzed claim limitations. Accordingly, Tolonen and Katz teach Claim 18 for the same reasons. *See supra* Sections VI.B.1, VII.B.3. This section will only discuss claim limitation 18[D].

(a) 18(d) Katz’s “*wireless communication interface [is] configured to support at least two wireless communication protocols.*”

Katz’s RF and Mixed-Signal Front End performs RFID communications with tags that operate according to different RFID protocols. Ex. 1003 ¶ 151. Katz explains different types of RFID tags, for example, Katz describes “[l]ow-frequency (LF) tags that utilize the 125-kHz-to-135-kHz portion of the [RF frequency] spectrum” and “[h]igh-frequency (HF) tags, [which] mostly operat[e] in the 13.56-

MHz band.” Ex. 1006 at 2. Accordingly, Katz’s RFID reader front end is operable to communicate with different RFID reader protocols. *See* Ex. 1003 ¶ 151.

Additionally, the AD9861 MxRF, described and incorporated into Katz, is operable to communicate according to different protocols, as it is designed for various applications including “broadband access,” “broadband LAN,” and other “communications (modems).” *See* Ex. 1009, AD9861 datasheet at 1; *see also*, Ex. 1003 ¶ 152.

Finally, Katz’s 802.11 chipsets are able to support different IEEE protocols such as 802.11a, b and/or g. *See* Ex. 1006 at 4.

4. Claim 19

(a) *Katz’s “wireless communication interface is implemented using a single multi-protocol chipset.”*

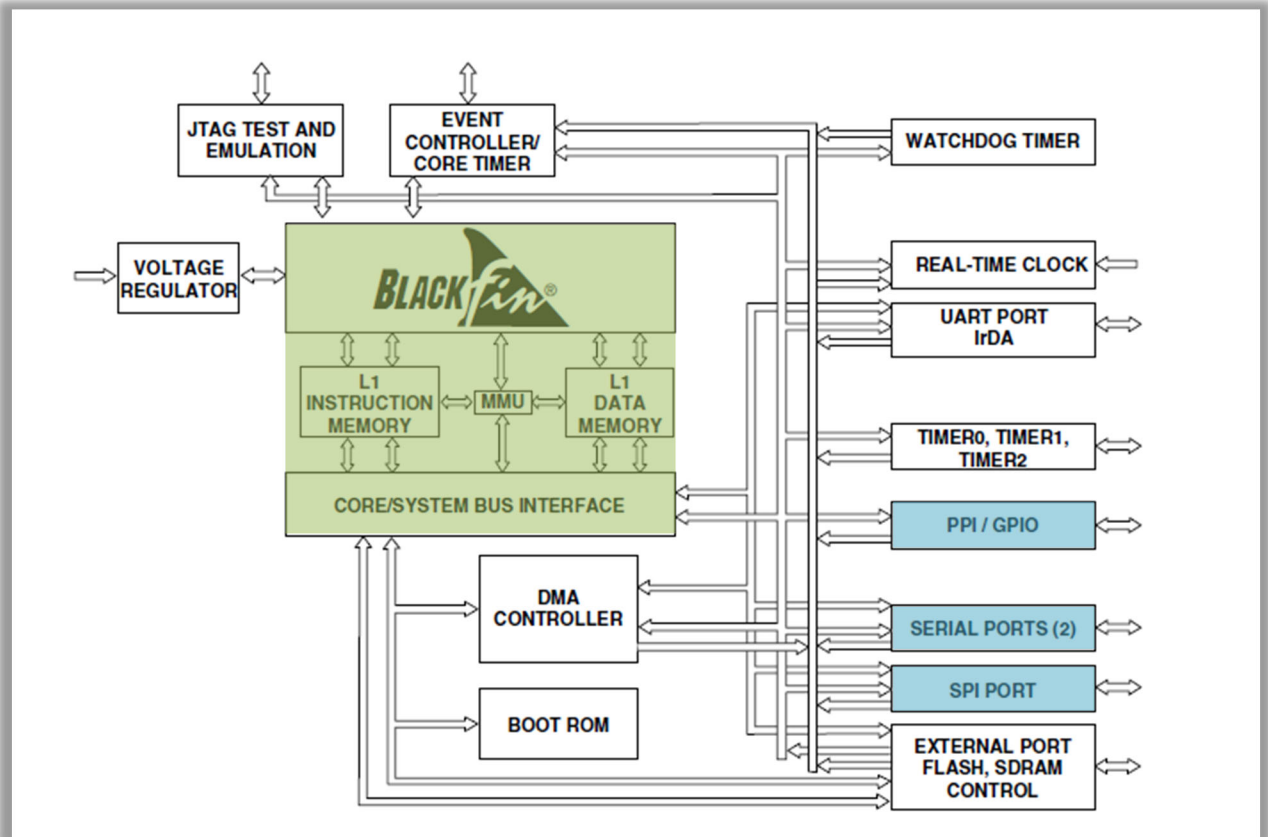
The AD9861 MxFE described and incorporated into Katz is “provided in a 64-lead lead frame chip scale package (LFCSP).” Ex. 1009, AD9861 Datasheet at 22.

5. Claim 20

(a) *Katz’s “wireless communication interface is implemented using two or more chipsets.”*

Katz’s processor “can connect directly to 802.15.4 ZigBee and IEEE 802.11 chipsets via the SPI and SPORT peripherals.” Ex. 1006 at 3. Implementing the entire interface, Katz’s processor connects to the MxFE via the parallel peripheral

interface, and connects to the wireless protocol chipsets using SPI and SPORT peripherals, as shown below in Figure 1 of the ADSP-BF531 Data Sheet. Ex. 1006 at 3; *see also* Fig. 7.



Ex. 1007, Fig. 1 (annotated).

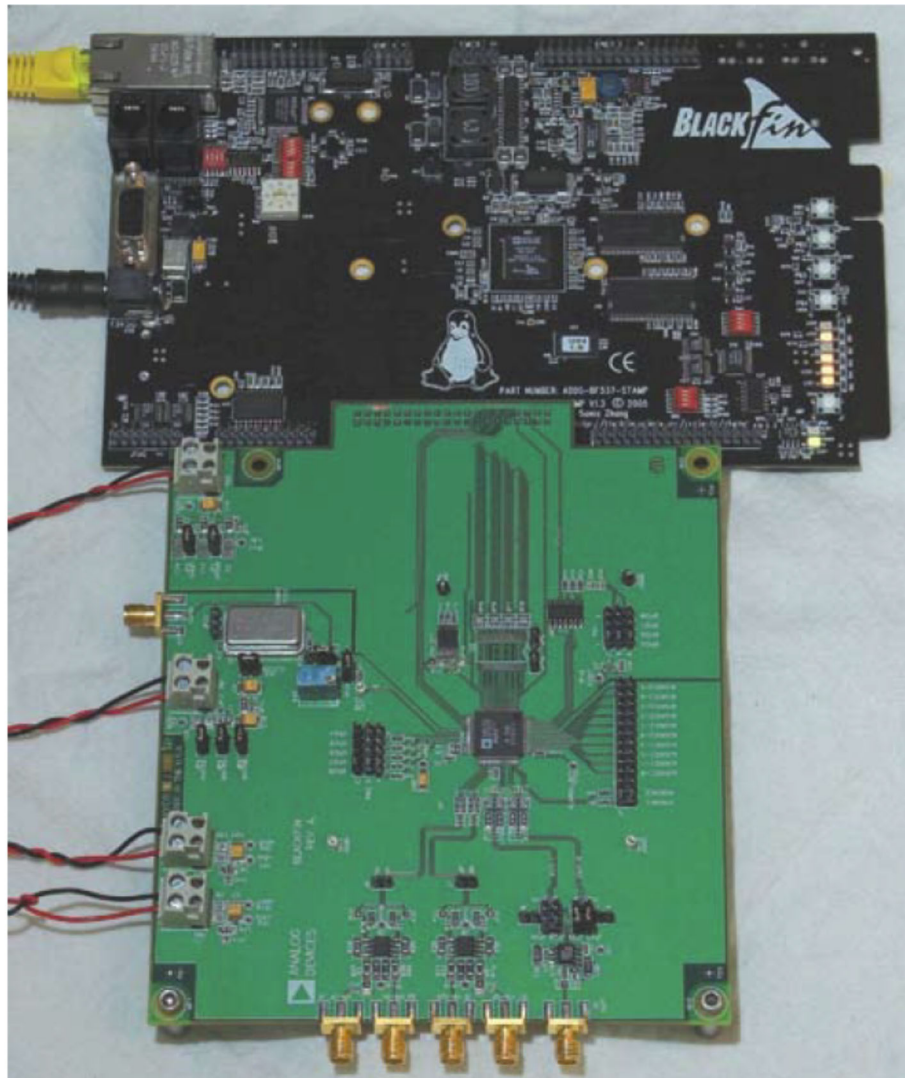


Figure 7. A Blackfin-based evaluation system for RFID reader applications.

Ex. 1006, Fig 7.

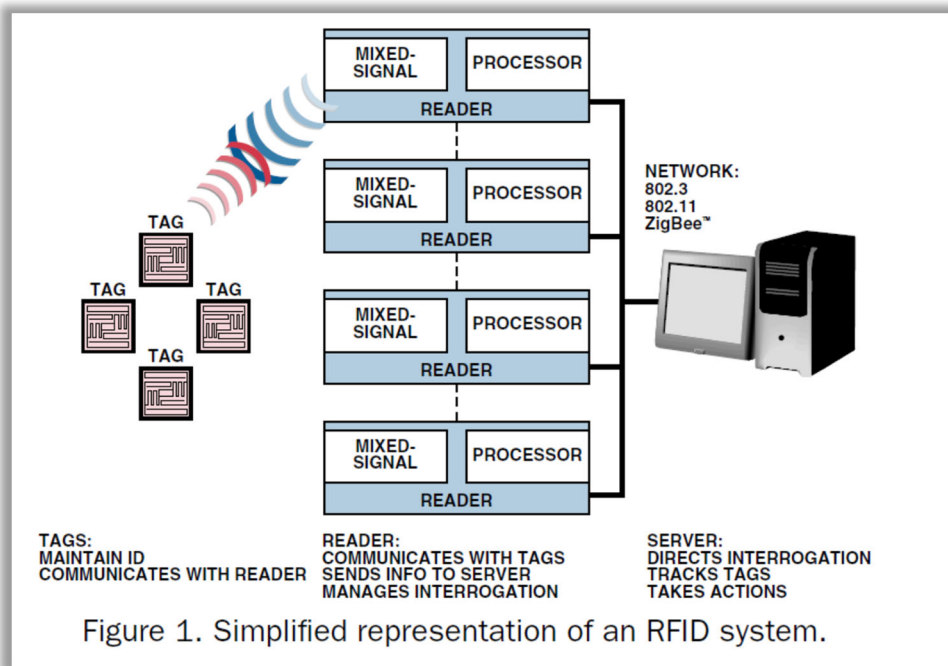
VII. GROUND 3: Anticipation of Claims 1 and 2 over Katz.

A. Katz invalidates the claims.

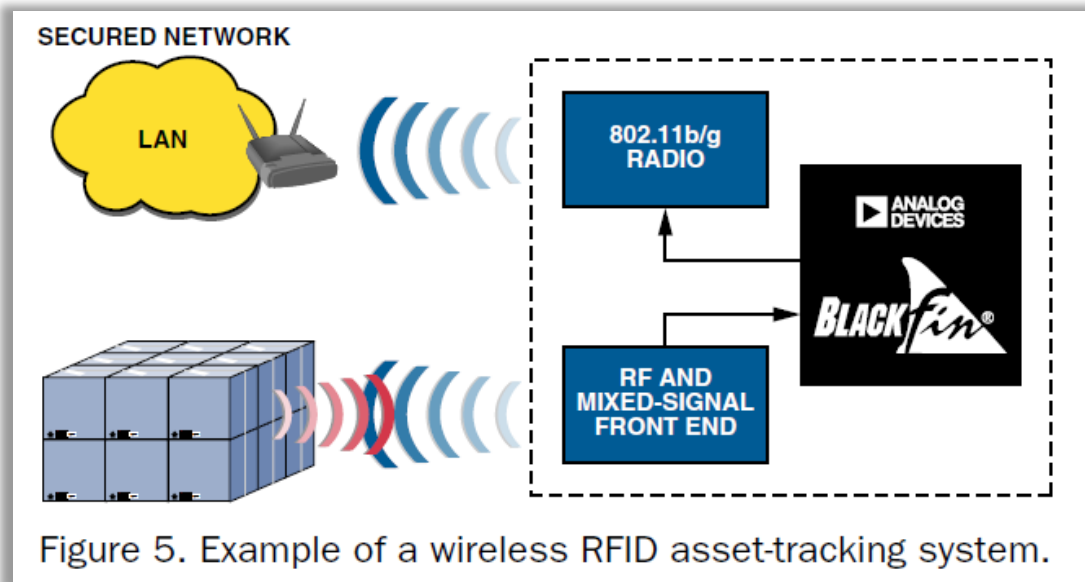
1. Claim 1

(a) *I[pre] Katz discloses “[a]n encoded information reading (EIR) terminal.”*

Katz discloses an RFID tag reading system, which includes a blackfin Processor, mixed-signal front ends to “communicate with tags,” and an 802.11 chipset for communication with backend servers. Ex. 1006 at 1, Figs. 1, 5.



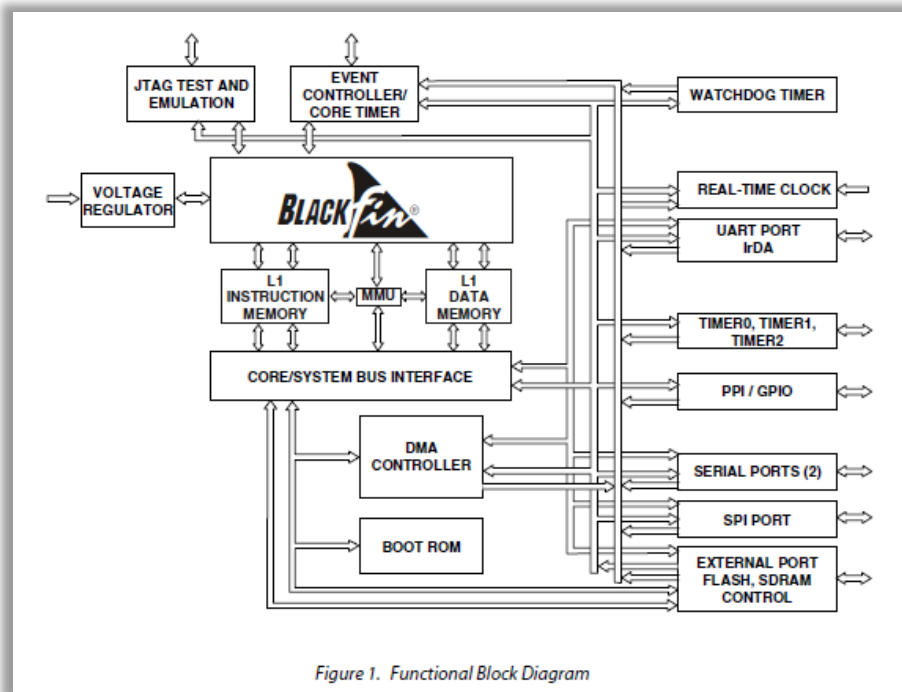
Ex. 1006, Fig 1.



Ex. 1006, Fig. 5.

(b) *1[A] Katz’s RFID system comprises “a microprocessor electrically coupled to a system bus.”*

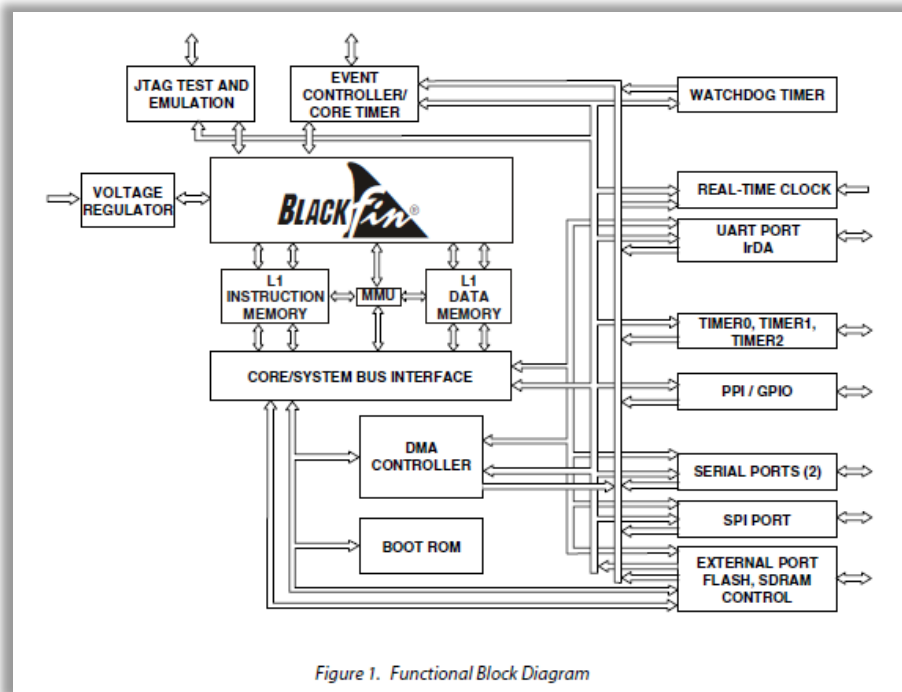
Katz’s RFID system includes a Blackfin embedded processor that is connected peripherals via “several high bandwidth buses.” Ex. 1006 at 3–4; Ex. 1007 at 1, 4; Ex. 1003 ¶ 158 (explaining that an embedded processor is a microprocessor designed for an embedded system). Katz’s Blackfin processor combines a signal processing engine with RISC-like microprocessor instruction sets. Ex. 1007 at 4; Ex. 1003 ¶ 158 (explaining that RISC is an instruction set architecture used for “Microprocessors without Interlocked Pipelined Stages”). As shown below in Figure 1 of a datasheet for the ADSP-BF531 Blackfin processor, Katz’s processor is electrically coupled to the core/system bus interface via the L1 instruction and data memories, and the memory management units. Ex. 1007 at 4, Fig. 1.



Ex. 1007, Fig 1.

(c) *1[B] Katz's RFID system comprises "a memory communicatively coupled to said microprocessor."*

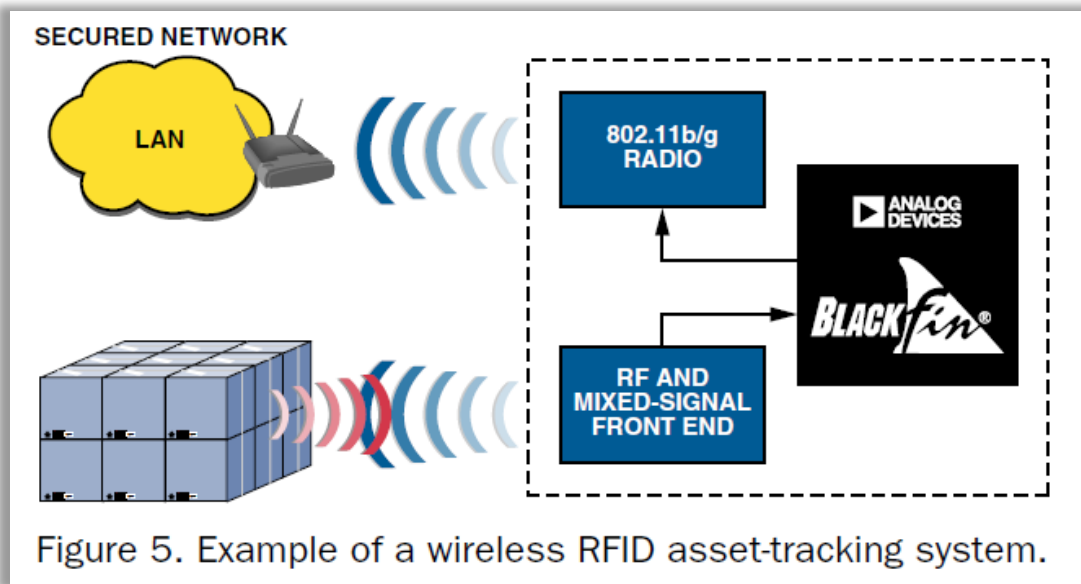
As shown in Figure 1 below, Katz's processor interfaces with L1 Instruction Memory and L1 Data Memory. Ex. 1007 at 5–7, Fig. 1.



Ex. 1007, Fig 1.

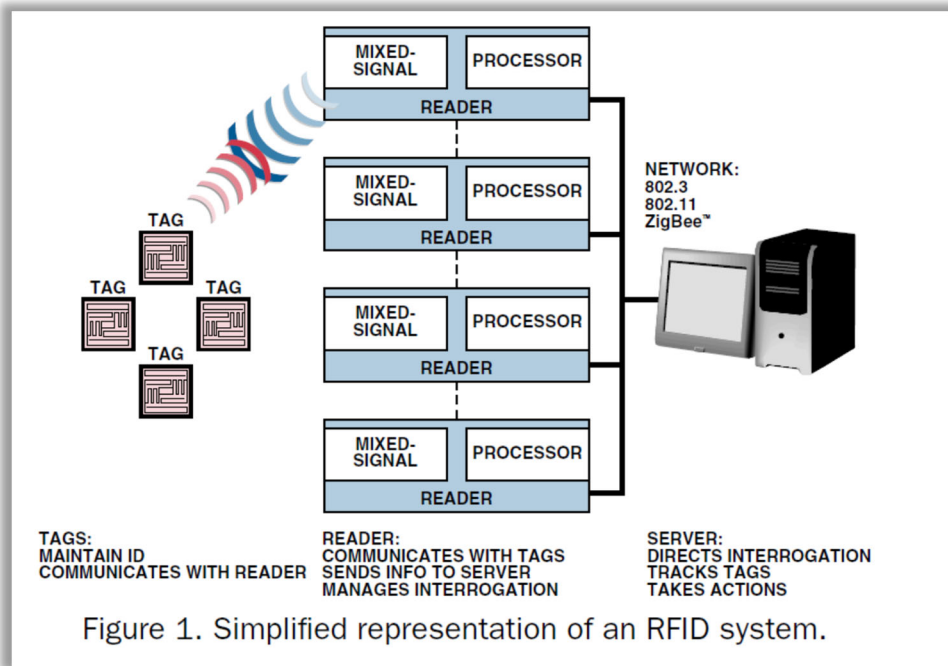
- (d) *1[C] Katz's RFID system comprises "an encoded information reading (EIR) device selected from the group consisting of a bar code reading device, an RFID reading device, and a card reading device, said EIR device configured to perform at least one of outputting raw message data containing an encoded message and outputting decoded message data corresponding to an encoded message."*

As shown in Figure 5 below, Katz's processor interfaces with RF and Mixed-Signal Front End. Ex. 1006 at 4, Fig. 5.



Ex. 1006, Fig. 5.

Katz teaches that the Mixed-Signal Front End (MxFE) integrated circuit communicates with RFID tags, performing “interrogation, decoding, and processing of the ... received tag information.” Ex. 1006 at 1-4. For example, as shown in figure 1, below, Katz’s mixed-signal front end receives information from tags after interrogation, decodes that information, and outputs the decoded message through the 802.3, 802.11, or ZigBee networks. *Id.* at 1.



Ex. 1006, Fig. 1.

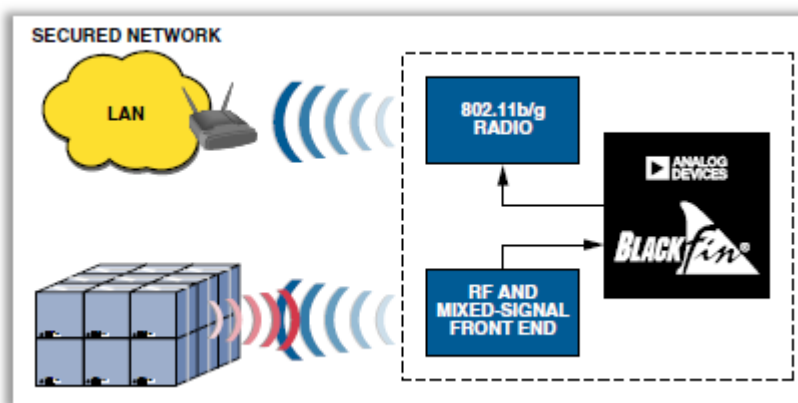
Katz’s MxFE operates to perform the encoding and decoding of radio messages for RF communication. For example, Katz teaches that the software for the Reader’s front end performs the “filter- and transform-intensive signal processing.” Ex. 1006 at 3. In this way, Katz’s MxFE front end outputs raw message data containing an encoded message. *See* Ex. 1003 ¶ 162 (explaining that as arranged the RF Front end receives encoded analog data from the tag, converts the data to raw digital encoded data and outputs it to the Blackfin processor).

Katz additionally contemplates that a camera can “be connected to an RFID reader” such that “[b]esides RFID applications, ... Blackfin features are also especially attractive for 1D and 2D barcode applications, because of Blackfin’s ability to perform system control, networking, and imaging processing on the same

device.” Ex. 1006 at 3. In this arrangement, the camera (e.g., EIR device) receives encoded information (e.g., machine readable barcode data) and outputs that raw encoded data to the Blackfin processor. Ex. 1003 ¶ 163.

- (e) *1[D] Katz’s RFID system comprises “a wireless communication interface comprising a radio frequency front end configured to perform at least one of receiving a first radio signal and transmitting a second radio signal, said radio frequency front end electrically coupled to at least one of an analog-to-digital converter (ADC) electrically coupled to said system bus and a digital-to-analog converter (DAC) electrically coupled to said system bus.”*

Katz teaches that the Blackfin processor “can connect directly to both 802.15.4 ZigBee and IEEE 802.11 chipsets via the SPI and SPORT peripherals.” Ex. 1006 at 3, Fig. 5; *see also*, Ex. 1008 (showing the SPI and SPORT peripherals connected to the system bus).



Ex. 1006, Fig. 5.

IEEE 802.11 chipsets, by design, include an RF front end electrically coupled to an ADC and DAC, which are both electrically coupled by bus to the processor

that controls the chip. *See* Ex. 1003 ¶¶ 164-65 (citing, e.g., IEEE 802.11g; Atheros AR5007EG data sheet). Nevertheless, to the extent other 802.11 chipsets existed that were not designed around having ADC and DAC coupled to the RF Front end and to the system bus, it would have been obvious to a POSITA to include such a chip as one possible option amongst those available at the time. Ex. 1003 ¶ 166.

(f) *1[E] Katz’s RFID system discloses “wherein said microprocessor is configured to execute at least one of a base-band encoder software program and a base-band decoder software program.”*

Katz’s processor concurrently executes all “three elements of the RFID reader software architecture ...: the *back-end server interface*, the *middleware*, and the *front-end tag reader algorithms*.” Ex. 1006 at 2 (emphasis in original). In the front-end algorithms, Katz’s processor base-band encodes and decodes by performing filtering and transformative signal processing. Ex. 1003, ¶ 168.

(g) *1[F] Katz’s “base-band encoder software program is configured to produce a first encoded bit stream by performing at least one of the following functions: source encoding of a first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, and media access control.”*

As discussed above, Katz’s processor executes front-end, middleware, and backend software, including performing “filter and transformative-intensive signal processing.” Ex. 1006 at 2–3; *see supra* Section VII.A.1(b)–(c); *see also*, Ex. 1003 ¶ 169 (explaining that the filter- and transform-intensive signal processing at the

front end includes at least frequency spreading, multiplexing, and modulation because this is how the front end communicates with different radio signal receivers). Furthermore, Katz explicitly teaches that its blackfin processor supports both split-MAC and full-MAC 802.11a/b/g implementations, which indicates Katz's blackfin processor executes software that performs Medium Access Control. Ex. 1006 at 4; Ex. 1003 ¶ 169.

(h) *I[G] Katz's "DAC is configured to output to said radio frequency front end an analog signal corresponding to said first encoded bit stream."*

For example, Katz explains that the Blackfin processor can connect directly to both 802.15.4 ZigBee and IEEE 802.11 chipsets via the SPI and Sport Peripherals. Ex. 1006 at 3; *see supra* Section VII.A.1(e). As the 802.11 chipset has a DAC, for example, the 802.11 chipset receives encoded data from the Blackfin processor, converts it to an analog signal, and communicates the analog signal as a radio wave through the chipset's front end. Ex. 1003 ¶¶ 170-71.

(i) *I[H] Katz discloses "wherein said ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said radio frequency front end."*

For example, Katz explains that the Blackfin processor can connect directly to both 802.15.4 ZigBee and IEEE 802.11 chipsets via the SPI and Sport Peripherals. Ex. 1006 at 3; *see supra* Section VII.A.1(e). As the 802.11 chipset has an ADC, for example, the 802.11 chipset receives encoded analog data through the RF Front end

and converts it to a digital signal for receipt by the Blackfin processor. Ex. 1003 ¶¶ 170-71.

- (j) *1[I] Katz’s “base-band decoder software program is configured to produce a second bit stream corresponding to said second encoded bit stream by performing at least one of the following functions: media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding.”*

Katz’s processor executes software for “manag[ing] the interrogation, *decoding*, and processing of the received tag information.” Ex. 1006 at 1. Moreover, when Katz’s processor executes filter-and transformative-intensive signal processing front-end software, the software must inherently include channel and/or source decoding. Katz’s processor sends data that can be stored on a central database application “with functions that include matching, tracking, and storage.” Ex. 1006 at 2. Because Katz’s RFID system is directed toward helping a user in “read[ing] the information [the tags] carry ... maintain[ing] and update[ing] the tag database, generating alerts or initiating other information-based processes within the enterprise,” the software must inherently (either channel or source) decode the bit stream into data that can be matched, tracked, stored, and retrieved later from a database in a readable form. Ex. 1006 at 1. Furthermore, Katz explicitly teaches that its blackfin processor supports both split-MAC and full-MAC 802.11a/b/g implementations, which indicates Katz’s blackfin processor executes software that performs Medium Access Control. Ex. 1006 at 4; Ex. 1003 ¶ 174.

2. Claim 2

- (a) *Katz’s “EIR terminal is devoid of dedicated hardware components configured to implement at least one of the following functions: source encoding of said first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, and source decoding.”*

To implement a RFID tag reading system, Katz discloses three elements of software architecture: “the back-end server interface, the middleware, and the front-end tag reader algorithms.” Ex. 1006 at 2 (emphases omitted). “Though distinct, all these elements of the software architecture can run concurrently on a single Blackfin processor.” *Id.* Solely relying on software to perform all requisite tag reading functions, Katz’s RFID systems is *devoid of dedicated hardware components. Id.*; *see also*, Ex. 1003 ¶ 175.

VIII. GROUND 4: Obviousness of Claims 3–23 over Katz in view of Ishizu.

A. Motivation to Combine

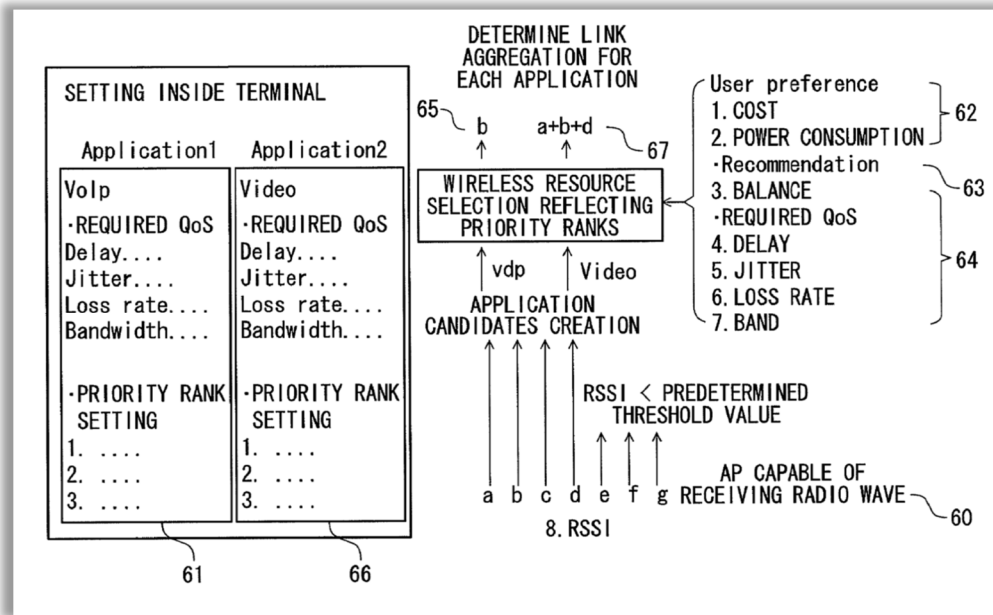
A POSITA would have been motivated to combine Katz with Ishizu. Ex. 1003 ¶¶ 176-81.

Katz teaches an RFID system that includes an RF and Mixed-Signal Front end and an 802.11b/g Radio chipset connected to a Blackfin Processor. Ex. 1006 at 4. Katz teaches that the processor runs software for controlling the operation of the reader. *Id.* at 2-4. For example, Katz’s processor performs “[m]anaged power

consumption ... using the dynamic power management capabilities.” *Id.* at 4. Katz teaches that “[t]hese dynamic power modes are designed to enable flexible performance and power arrangements for just about any networked system.” *Id.* In keeping with the goal of flexible performance, Katz teaches that its μ Clinux operating system in connection with the ADEOS real-time scheduler “gives the user hard real-time control of the application, while at the same time allowing access to all the benefits of open-source software.” *Id.* at 5.

A POSITA reading Katz would understand Katz’s motivation to implement a flexible scheduling program that enables flexible performance and power management. Ex. 1003 ¶ 179. Accordingly, the POSITA would have looked to a reference like Ishizu. *Id.*

Ishizu teaches “a communication terminal capable of dynamic reconfiguration ... of connection to a plurality of wireless communication networks.” Ex. 1010 ¶ 32. Ishizu’s terminal employs a “connection policy information table” and a “communication network reconfiguration management means for selecting a connection method of a wireless communication network.” *Id.* ¶ 38. Ishizu teaches that the connection policy information considers communication priority specified by the user. *Id.* ¶ 77. As shown in Figure 6, below, Ishizu’s connection policy is based on an algorithm that considers user preferences. *Id.* ¶ 144, Fig. 6.



Ex. 1010, Fig. 6.

As Ishizu's connection policy information pertains to "communication methods" like IEEE 802.11b, *see* Ex. 1010 ¶ 37, a POSITA would have realized Ishizu's usefulness to Katz's RFID reader system, which uses an 802.11b/g radio chipsets. Ex. 1006 at 4; Ex. 1003 ¶ 181. A POSITA would have implemented Ishizu's "communication network reconfiguration management means, including Ishizu's connection policy in Katz's blackfin processor as part of Katz's RFID control software would implement and would have realized the predictable benefit of controlling network connection according to Ishizu's teaching. *Id.* Moreover, because Ishizu's policy is designed to control communications through communication modules, such as those employing IEEE 802.11b, a POSITA would have expected the combination to predictably result in an RFID reader system as

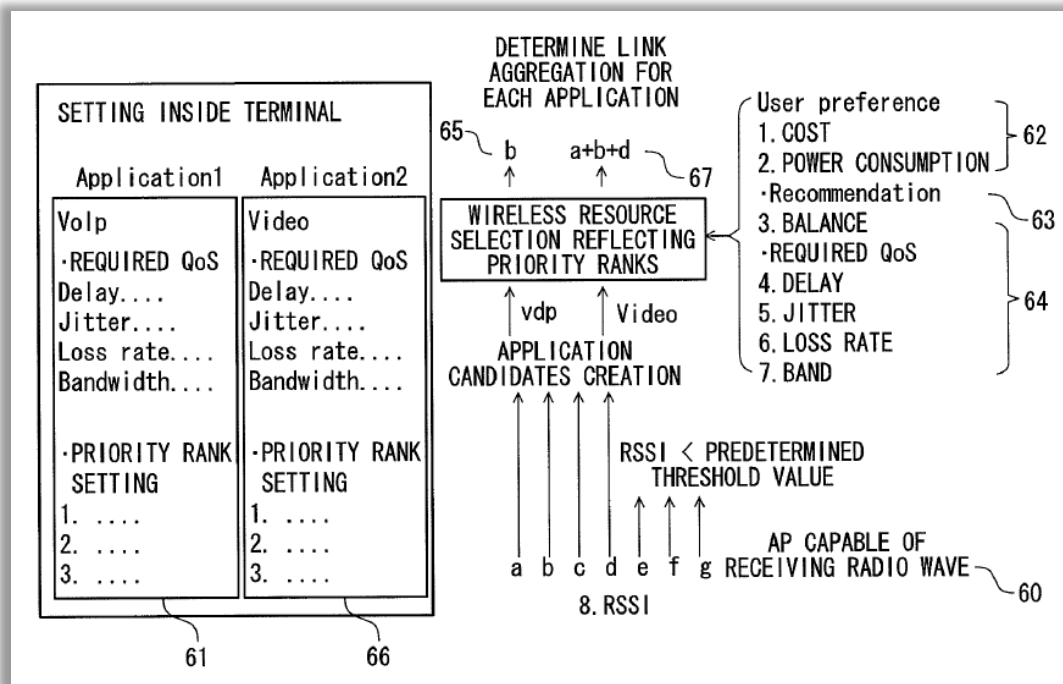
described by Katz that relies on the connection policy methodologies described by Ishizu. *Id.*

B. Katz in view of Ishizu Invalidates the Claims

1. Claim 3

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 1, further comprising a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.A. Employing Ishizu’s connection policy, the Katz–Ishizu RFID system is “capable of *dynamic reconfiguration* of connection with different wireless communication networks” based on “priority specified by the user.” Ex. 1010 ¶¶ 30, 77. As shown below in Figure 6, Ishizu’s data aggregation device includes “a selection algorithm ... in order to select an optimal wireless resource according to preference of a user.” *Id.* ¶ 144.



Ex. 1010, Fig. 6.

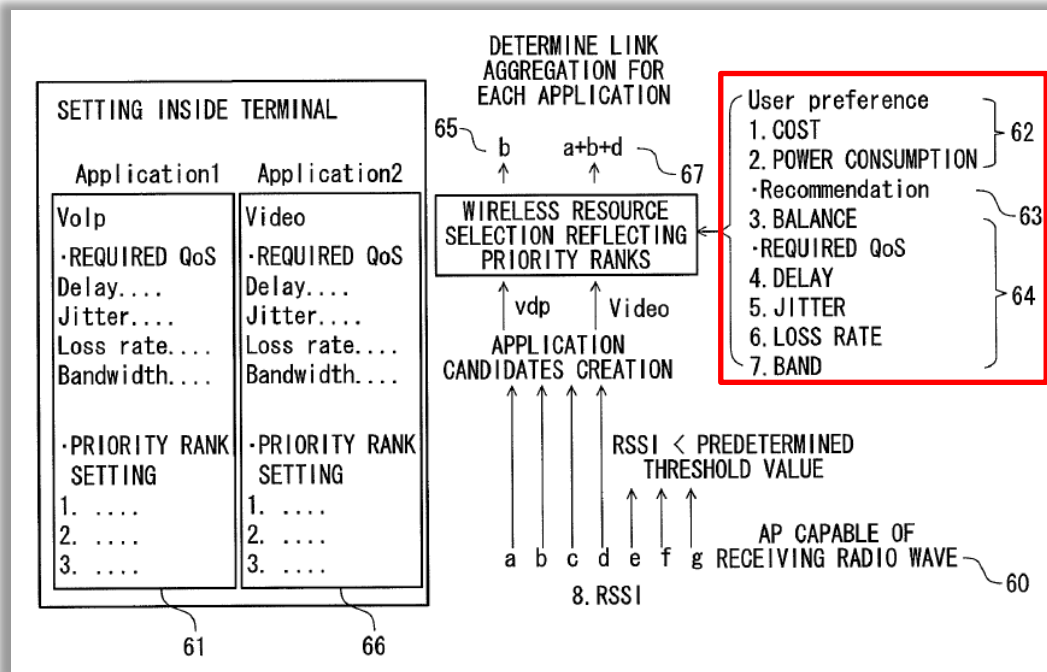
2. Claim 4

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 1, further comprising a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol.”*

Claim limitation 4[A] is identical to Claim 3. Therefore, all arguments from Claim 3 and Claim 1 are herein reasserted.

(b) *Katz in view of Ishizu discloses “wherein said value of said user-defined criterion is calculated based on at least one of network status, communication quality, signal strength, service cost, bandwidth, a user preference, and communication channel throughput.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.A. Ishizu’s data communication aggregation device uses a selection algorithm “to select an optimal wireless resource according to *preference of a user*,” which balances the user’s preference for “cost,” “communication quality,” and “power consumption,” against the required Quality of Service standard. Ex. 1010 ¶¶ 79, 144, Fig. 6. Using the selection algorithm, Ishizu iteratively evaluates wireless communication selection candidates to dynamically select the candidate “matching the cost requirement and power consumption requirement of the user.” *Id.* ¶ 147, Fig. 6.



Ex. 1010, Fig. 6 (annotated).

3. Claim 5

- (a) *Katz in view of Ishizu “[t]he EIR terminal of claim 1, further comprising a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol.”*

Claim limitation 5[A] is identical to Claim 3. Accordingly, Katz and Ishizu teach Claim 5[A] for the same reasons. *See supra* Section VIII.B.3.

- (b) *Katz in view of Ishizu discloses “wherein said EIR terminal is configured to search beacon signals over a pre-defined frequency range, and then select at least one of a wireless communication network and frequency channel which optimizes said user-defined criterion.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.B. Ishizu teaches that its data communication aggregation device can determine the (frequency) Band of the Access Point (e.g., beacon), which is “a value specific to [the] access point.” *See* Ex. 1010 ¶¶ 108–109. Ishizu explains that certain communication values can be derived from the access point “by known art in the application execution processing portion of the application executing device,” and that these values include usable [frequency] band, [frequency] band of access, and number of terminals connected to an Access Point. *Id.* ¶¶ 107–112 (reference numerals omitted). Based on this information, Ishizu’s data communication aggregation device determines “a congestion degree of an access point,” which affects whether to connect to this access point. *See id.* ¶¶ 113, 147.

4. Claim 6

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 1, further comprising a wireless communication protocol selector software program, said wireless communication protocol software program configured to optimize a value of a user-defined criterion in order to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol.”*

Claim limitation 6[A] is identical to Claim 3. Accordingly, Katz and Ishizu teach Claim 6 for the same reasons. *See supra* Sections VIII.B.3.

- (b) *Katz in view of Ishizu discloses “wherein said EIR terminal is configured to switch at least one of said wireless communication network and said wireless communication protocol responsive to evaluating said user-defined criterion.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.A. Ishizu teaches that because mobile communication terminals—like Katz’s RFID system—“are provided with a plurality of wireless communication methods, a user can select and *switches* to an optimal one from those methods or use some at the same time so as to increase the communication speed and to conduct wireless communication.” Ex. 1010 ¶ 6. Ishizu’s selection algorithm also calculates a balance using at least user

preferences and quality of service factors, and then iteratively evaluates to select a connection method. *Id.* ¶ 147; *see also, supra* Section VIII.B.4. Using the device’s communication network reconfiguration executing means, the device then switches to the selected connection method. Ex. 1010 ¶¶ 6, 38.

5. Claim 7

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 1, further configured to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol responsive to a user action.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.A. Ishizu’s data communication aggregation device requires a user’s interaction using a keyboard to input the user’s preferences. Ex. 1010 ¶ 95. A user may prefer criterions (*user action*) such as “cost” or “power consumption.” *See id.* ¶ 147, Fig. 6. Responsive to the user’s preference, the selection algorithm will then calculate the optimal wireless network and “select an optimal wireless resource according to *preference of a user.*” *Id.* ¶¶ 143–47.

6. Claim 8

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 1, further configured to dynamically select at least one of a wireless communication network, a wireless communication protocol, and a parameter of a wireless communication protocol responsive to scanning a pre-defined bar code.”*

In combination, Katz and Ishizu implement an RFID system that includes an RFID reader front end, an 802.11b/g chipset, and a processor running software for controlling the RFID Reader system, including scheduling communications according to Ishizu’s teachings. *See supra* Section VIII.A. As discussed previously, Katz’s RFID system can also integrate with a CMOS image sensor to function as a bar code reader. As Katz endeavors to enable flexible performance and power management, a POSITA would have recognized the need for Katz’s system to react to the increased transmission requirements from a CMOS image sensor and would have implemented Ishizu. Ex. 1006 at 4; Ex. 1003 ¶¶ 190-92; *see also supra* Section VII.A.1.d. For example, Ishizu teaches that when “an application requiring high-speed communication *such as image transmission is started by a user*,” Ishizu’s requirement information would “automatically change[] to ‘emphasis on communication quality.’” Ex. 1010 ¶ 96. Using the changed requirement information, Ishizu’s selection algorithm would recalculate and reevaluate to determine the preferred network candidate and dynamically reconfigure the network. Ex. 1010 ¶¶ 96, 147; *see also, supra* Section VIII.B.6.

7. Claim 9-14

Independent Claim 9 shares the same preamble and first-six claim limitations as claim 1 (e.g., 1[pre]-[E]). Claim 9 additionally incorporates claim 3. Accordingly, claim 9 is anticipated by Tolonen for the same reasons set forth for claims 1 and 3 above.

Dependent claims 10 through 14 depend from claim 9, but otherwise are identical to claims 4 through 8. Accordingly, claims 10 through 14 are anticipated by Tolonen for the same reasons set forth for claims 1, 3-8.

8. Claim 15

Claim 15 is comprised of a preamble and six claim limitations—all of which are disclosed by Katz and Ishizu. Specifically, claim 15 and claim 1 have the same preamble; claim limitations 15[A]–[E] are identical to claim limitations 1[A]–[E]; and claim limitation 15[F] is identical to claim 8. Accordingly, Katz and Ishizu teach Claim 13 for the same reasons. *See supra* Sections VII.A.1, IX.B.8.

9. Claim 16

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 15, wherein said base-band encoder software program is performed by at least one of a general purpose microprocessor, a specialized microprocessor.*

Katz’s RFID system includes a Blackfin processor for the wireless communication device. Ex. 1006 at 3. To implement a RFID tag reading system, Katz discloses three elements of software architecture: “the back-end server

interface, the middleware, and the front-end tag reader algorithms.” Ex. 1006 at 2 (emphases omitted). “Though distinct, all these elements of the software architecture can run concurrently on a single Blackfin processor.” *Id.*

In the same way, Ishizu discloses a “software wireless communication device ... [where] *demodulation* or the like is performed *by a digital signal processor or micro processor* and software.” Ex. 1010 ¶ 16.

10. Claim 17

- (a) *Katz in view of Ishizu discloses “[t]he EIR terminal of claim 15, wherein said base-band decoder software program is performed by at least one of a general purpose microprocessor, a specialized microprocessor.”*

Katz’s RFID system includes a Blackfin processor for the wireless communication device. Ex. 1006 at 3. To implement a RFID tag reading system, Katz discloses three elements of software architecture: “the back-end server interface, the middleware, and the front-end tag reader algorithms.” Ex. 1006 at 2 (emphases omitted). “Though distinct, all these elements of the software architecture can run concurrently on a single Blackfin processor.” *Id.*

In the same way, Ishizu discloses a “software wireless communication device ... [where] *demodulation* or the like is performed *by a digital signal processor or micro processor* and software.” Ex. 1010 ¶ 16.

11. Claim 18

Claim 18 is comprised of a preamble and five claim limitations—all of which are disclosed by Katz and Ishizu. Specifically, claim 18 and claim 1 have the same preamble; claim limitations 18[A]–[C] and [E] are identical to claim limitations 1[A]–[C] and [E]. This section will only discuss claim limitation 18[D]. In all other limitations, Katz in view of Ishizu discloses claim 18, and all arguments from Claims 1 are herein reasserted. *See supra* Section VII.A.1.

(a) *Katz in view of Ishizu discloses “a wireless communication interface configured to support at least two wireless communication protocols.”*

Katz’s device includes a wireless communication interface using a MxFE. In the same way, Ishizu’s device uses communication modules acting as radio frequency front ends. Ishizu’s communication modules, however, also “include [wireless] communication methods such as *WiFi* (compatible Wireless Fidelity, IEEE 802.11 b standard) and *WiMAX* (Worldwide Interoperability for Microwave Access, IEEE 802.16 standard) used in communication.” Ex. 1010 ¶ 37.

12. Claim 19

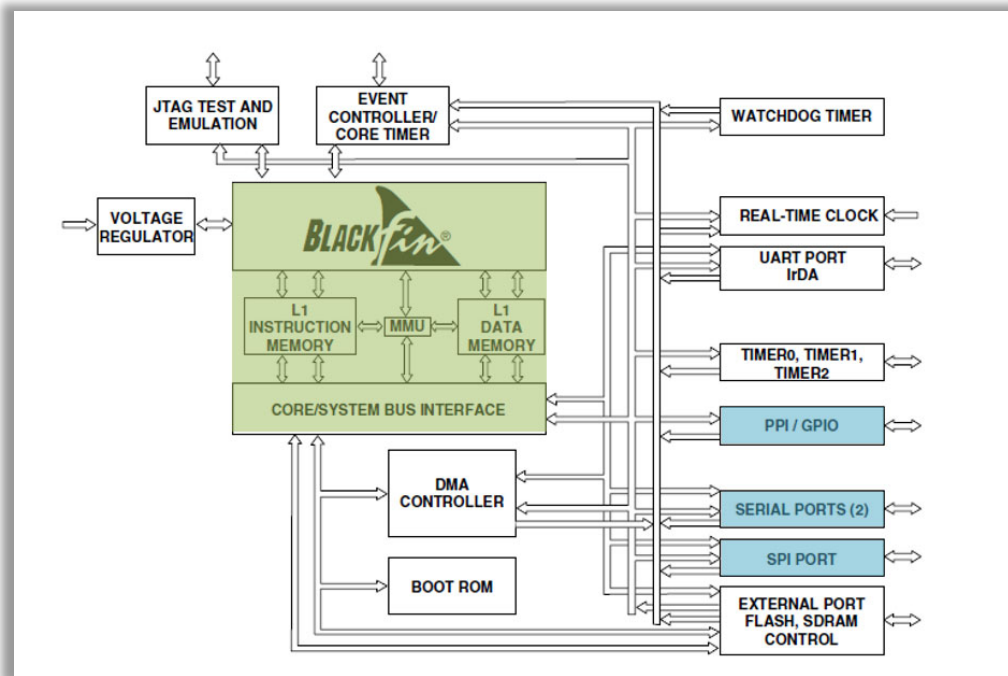
- (a) *Katz's "wireless communication interface is implemented using a single multi-protocol chipset."*

The AD9861 MxFE described and incorporated into Katz is "provided in a 64-lead lead frame chip scale package (LFCSP)." Ex. 1009, AD9861 Datasheet at 22.

13. Claim 20

- (a) *Katz's "wireless communication interface is implemented using two or more chipsets."*

Katz's processor "can connect directly to 802.15.4 ZigBee and IEEE 802.11 chipsets via the SPI and SPORT peripherals." Ex. 1006 at 3. Implementing the entire interface, Katz's processor connects to the MxFE via the parallel peripheral interface, and connects to the wireless protocol chipsets using SPI and SPORT peripherals, as shown below in Figure 1 of the ADSP-BF531 Data Sheet. Ex. 1006 at 3; *see also*, Fig. 7.



Ex. 1007, Fig. 1 (annotated).

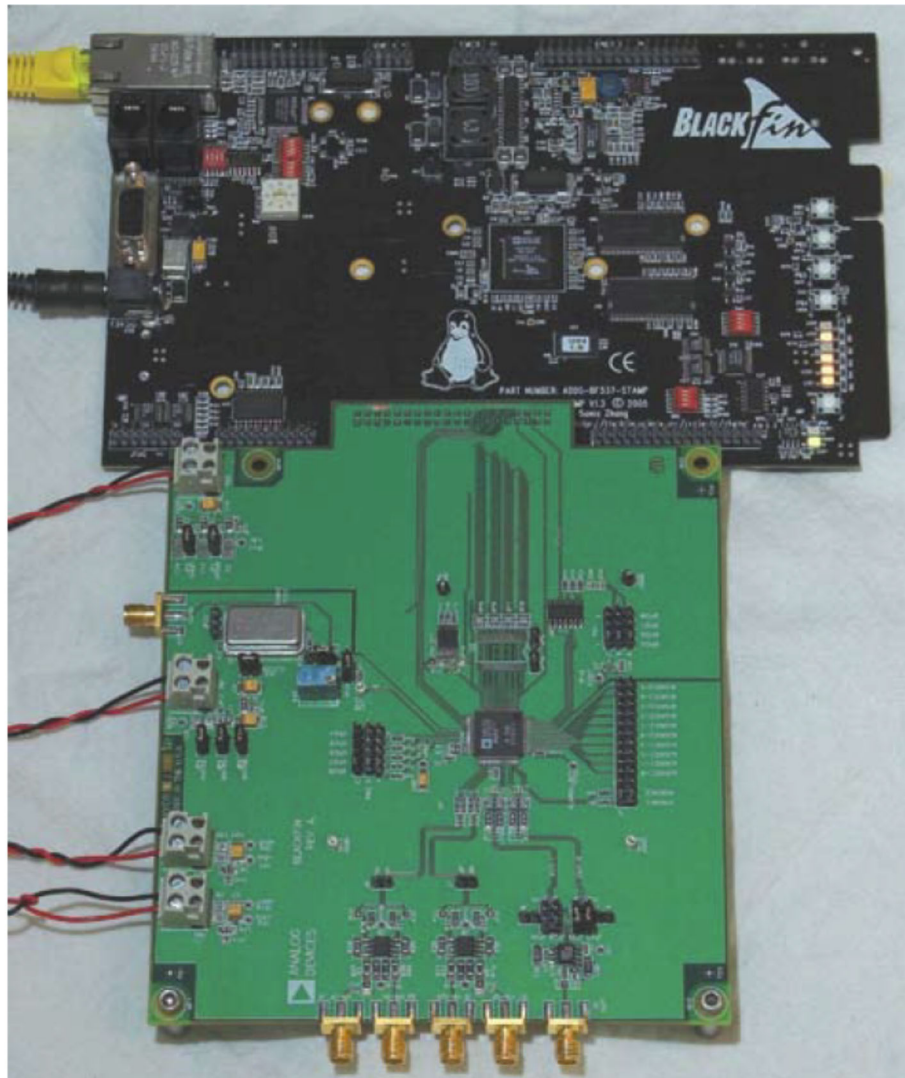


Figure 7. A Blackfin-based evaluation system for RFID reader applications.

Ex. 1006, Fig 7.

14. Claims 21 to 23

Dependent claims 21 to 23 are identical to claims 4 to 6, except that claims 21 to 23 depend from claim 18. Accordingly, claims 21 to 23 are anticipated by Tolonen for the same reasons set forth for claims 4 through 6 and 18.

IX. Conclusion

Therefore, *Inter Partes* Review of the challenged claims is therefore respectfully requested.

Respectfully submitted,

KING & SPALDING LLP

By: /s/ Dara M. Kurlancheek
Dara M. Kurlancheek, Reg. No. 69,815
Zachary Coots, *pro hac vice* to be
submitted

Counsel for Petitioner

X. Mandatory Notices

A. Real Parties-in-Interest Under 37 C.F.R. § 42.8(b)(1)

Petitioner and TransCore LP are the real parties-in-interest.

B. Related Matters Under 37 C.F.R. § 42.8(b)(2)

The '784 patent is presently the subject of a patent infringement lawsuit filed against Petitioner in the United States District Court for the District of Delaware. *Hand Held Products, Inc. et al. v. TransCore, LP et al.*, Case No. 23-cv-00686-MN. The '748 patent has not been subjected to post-grant review by the Patent Trial & Appeal Board.

C. Lead and Back-Up Counsel Under 37 C.F.R. § 42.8(b)(3)

Petitioner provides the following designation and service information for lead and back-up counsel. 37 C.F.R. § 42.8(b)(3) and (b)(4).

LEAD COUNSEL:

Dara M. Kurlancheek, Reg. No. 69,815
KING & SPALDING LLP
1700 Pennsylvania Avenue NW
Suite 900
Washington, D.C. 20006
(202) 626-5590
dkurlancheek@kslaw.com

BACKUP COUNSEL:

Zachary Coots (*pro hac vice* to be filed)
KING & SPALDING LLP
1700 Pennsylvania Avenue NW
Suite 900
Washington, D.C. 20006

(202) 394-4483
zcoots@kslaw.com

Petitioner consents to electronic service by email at the email addresses:
dkurlancheek@kslaw.com and zcoots@kslaw.com.

CERTIFICATION OF WORD COUNT

The undersigned certifies pursuant to 37 C.F.R. §42.24 that the foregoing Petition for *Inter Partes* Review, excluding any table of contents, mandatory notices under 37 C.F.R. §42.8, certificates of service or word count, or appendix of exhibits, contains 13,979 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: January 9, 2024

Respectfully submitted,

By: /s/ Dara M. Kurlancheek
KING & SPALDING LLP
1700 Pennsylvania Avenue NW
Suite 200
Washington, D.C. 20006
(202) 626-5590

Counsel for Petitioner

CERTIFICATE OF SERVICE

Pursuant to 37 C.F.R. §§ 42.6(e) and 42.105(b), the undersigned certifies that on January 9, 2024, a complete and entire copy of this Petition for *Inter Partes* Review and Exhibits were provided overnight mail to counsel for Patent Owner by serving copies to the address below for the '784 patent:

Douglas L. Sawyer, Esq.
Mark T. Smith, Esq.
PAUL HASTINGS, LLP
71 South Wacker Drive, Suite 4500
Chicago, IL 60606

Respectfully submitted,

By: /s/ Dara M. Kurlancheek
KING & SPALDING LLP
1700 Pennsylvania Avenue NW
Suite 200
Washington, D.C. 20006
(202) 626-5590

Counsel for Petitioner