

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE PATENT TRIAL AND APPEAL BOARD

TRANSCORE, LP

Petitioner,

v.

HAND HELD PRODUCTS, INC.,

Patent Owner

Case IPR2024-00443

Patent 8,919,654

PETITION FOR *INTER PARTES* REVIEW OF

U.S. PATENT NO. 8,919,654

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EXHIBIT LIST

Exhibit	Description
1001	U.S. Patent 8,919,654 to Wang, <i>et al.</i> (“the ’654 patent”).
1002	File History for U.S. Patent 8,919,654
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 (5 th 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	Atheros Communications, Press Release: Atheros Launches the World’s Most-Integrated, Single-Chip 802.11g Solution for PCI Express (Dec. 5, 2006)
1017	ISO/IEC 15693-3 First Edition (2001)
1018	EPCglobal, Radio-Frequency Identify Protocols Class-1 Generation-2 UHF RFID Protocol for Communications at 860 MHz–960 MHz version 1.1.0 (2005)

Exhibit	Description
1019	E. Triantaphyllou et al., <i>Multi-Criteria Decision Making: An Operations Research Approach</i>
1020	English Translation of Japanese Application Laid Open 2003-152732A
1021	Japanese Application Laid Open 2003-152732A
1022	Affidavit by John Kevin Marchioro Attesting to the Accuracy of Translation
1023	File History for U.S. Patent 8,141,784

I. Introduction

TransCore, LP (“Petitioner”) requests *Inter Partes* Review of claims 1–20 of U.S. Patent No. 8,919,654 (“the ’654 patent”).

The ’654 patent describes and claims a system (e.g., encoded information reading terminal) to communicate encoded messages via wireless radio signals. The ’654 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. Specifically, the ’654 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 ’654 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 '654 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 '654 patent was filed on Mar. 6, 2014, claiming priority to application No. 13/430,121, filed Mar. 26, 2012, which is a division of application No. 12/567,158, filed on Sep. 25, 2009. Pre-AIA 35 U.S.C. §§ 102–13 governs this patent. 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 '654 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 1–20 are anticipated over Tolonen pursuant to 35 U.S.C. § 102 or are obvious over Tolonen in view of the knowledge of a POSITA as detailed below.

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

GROUND 3: Claims 4–20 are obvious over Katz in view of Ishizu pursuant to 35 U.S.C. § 103.

Ground 4: Claims 1-20 are anticipated over Ishizu pursuant to 35 U.S.C. § 102.

C. Level of Skill in the Art

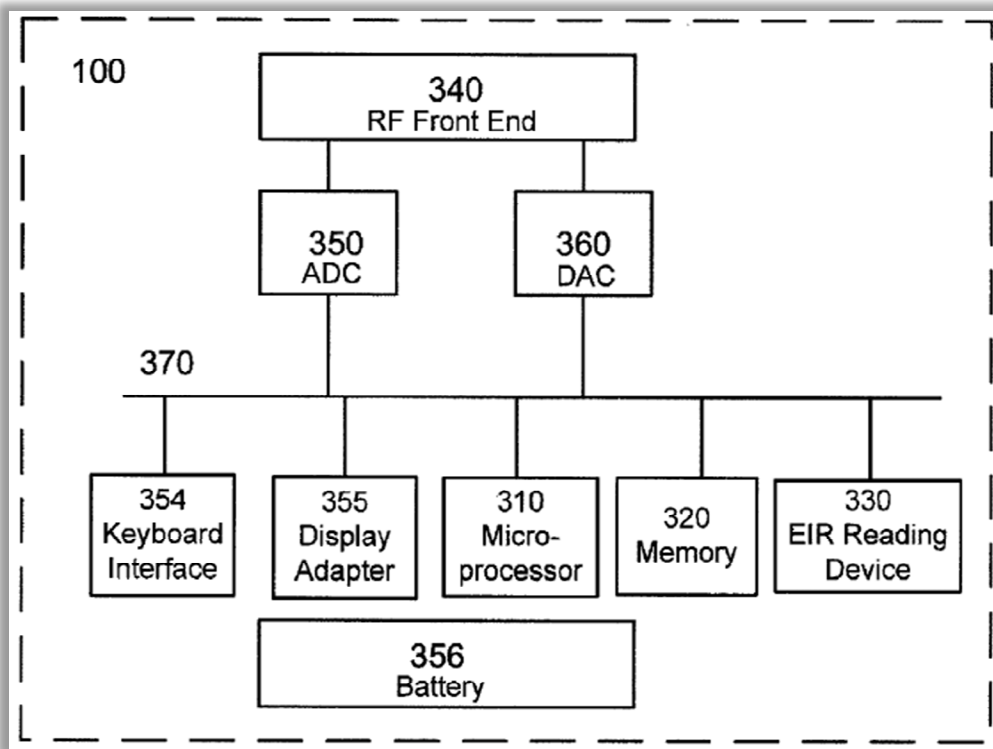
A person of ordinary skill in the art (“POSITA”) at the time of the alleged invention will have had either a master’s degree in computer science with at least two-years’ experience developing RFID technology or a bachelor’s degree with four years of said experience. Ex. 1003, ¶¶ 21-24.

IV. Background – the ’654 Patent

A. Overview

The ’654 patent is directed to “encoded information reading (EIR) terminals,” more specifically, to an EIR terminal comprising a multi-protocol wireless communication interface.” Ex. 1001, 1:17-20. The ’654 patent suggests the “need for further advances in EIR terminals and systems which would support multiple communication protocols and standards.” *Id.* 1:32-34.

The ’654 patent’s EIR terminal connects a microprocessor, a memory, a wireless communication interface, and an encoded information reading device to a system bus. *Id.* 1:38–43.



Ex. 1001, Fig. 3.

To select different wireless communication networks, communication protocols, or parameters, the '654 patent describes a “wireless communication protocol selector software program.” *Id.* 9:7-11. The '654 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.* 9:15-21. For example, the '654 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.* 9:24-29.

B. The '654 Patent's Prosecution History

The '654 Patent's Prosecution History does not reflect thorough examination. No art was cited to reject the '654 patent's application, Application No. 14/199,120 (the “'120 application”). The '120 application was only rejected for double patenting and issued as a result of Applicant filing a terminal disclaimer. Ex. 1002, 96-97. This essentially amounts to a first-action allowance.

Although the '654 patent is a division of U.S. Patent No. 8,141,784, the '784 patent was also not thoroughly examined. The rejection cited a single reference, Yeakley, U.S. Pub. 2007/0152058, which disclosed “a host computer ... a microprocessor including a memory, a user interface, an output interface[,] ... [and] a Bluetooth radio transceiver device,” and relied on official notice to support (1) Bluetooth being encrypted; (2) it would have been obvious to use Bluetooth with Yeakly; and (3) A/D conversion is typical of bar code readers. Ex. 1023 at 366-67. The Applicant overcame this rejection arguing that official notice to summarily reject all claims did not amount to *prima facie* obviousness. *Id.* at 286, 301-302.

C. Encoded Information Reading Terminals were Known in the Art

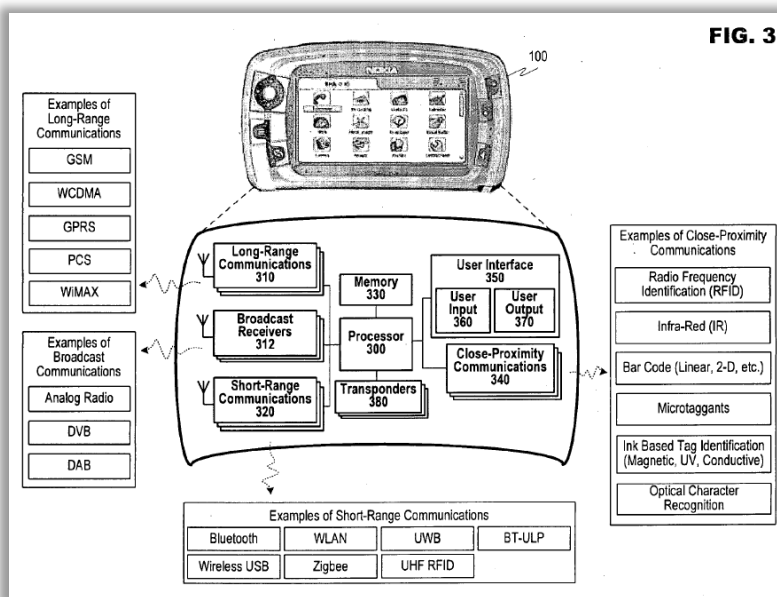
Everything claimed by the '654 patent was well-known and conventional. For example, RFID readers and Bar Code readers were conventional in the art. *See, e.g.*, Ex. 1006, at 1; Ex. 1005, ¶ 56; Ex. 1003, ¶¶ 47-49. At the time the '654 patent was filed, it was also known that software defined radios (“SDR”) 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, 7 (Chapter by Mark Cummings); *see also, e.g.*, Ex. 1005, ¶ 56, Ex. 1006, 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, 7; Ex. 1012, 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 '654 patent describes a non-novel and/or obvious invention.

D. The Prior Art

1. Tolonen

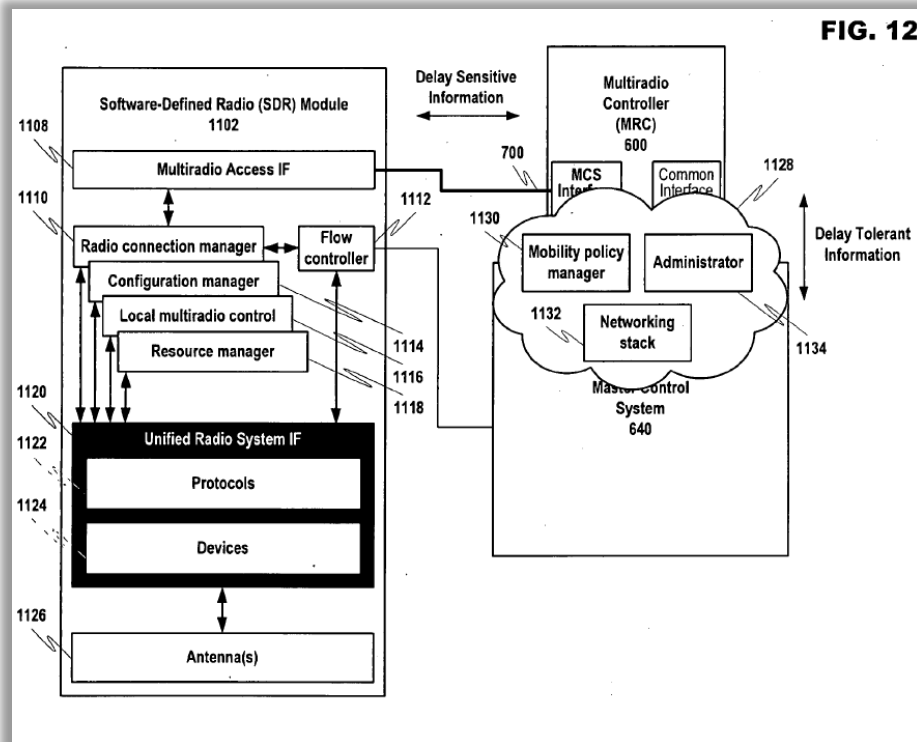
Tolonen teaches a WDC that includes communication modules 310, 312, and 320 for long-range, broadcast, and short-range, respectively. Ex. 1005, ¶ 50. Any one of these modules may be implemented through an SDR. Ex. 1005, ¶ 92. As shown in Figure 3, the WDC include communication protocols like Bluetooth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

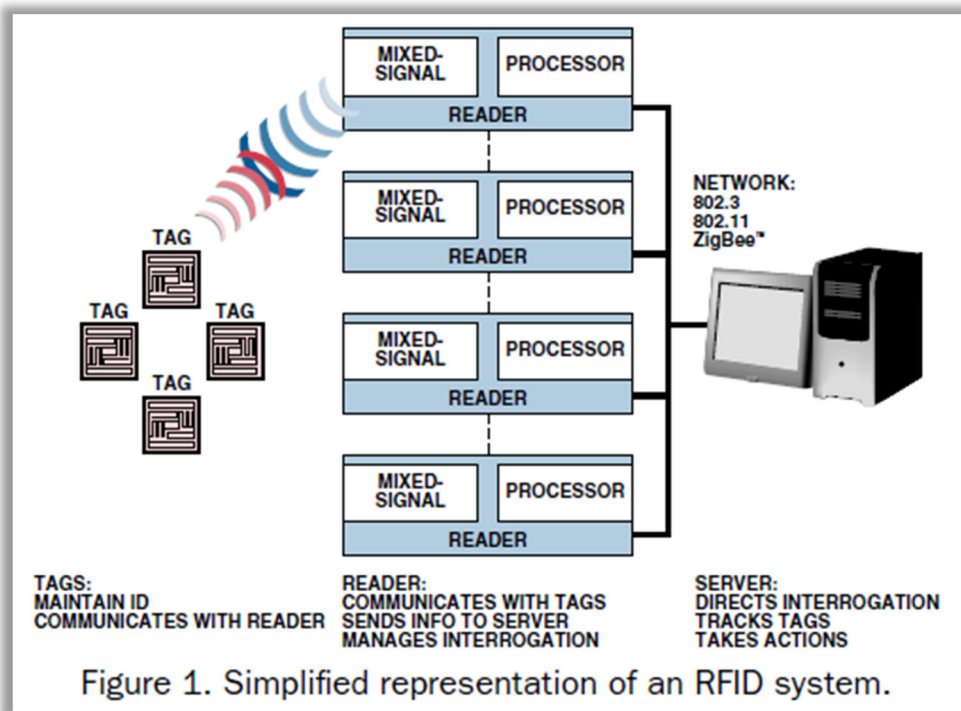


Ex. 1005, Fig. 12.

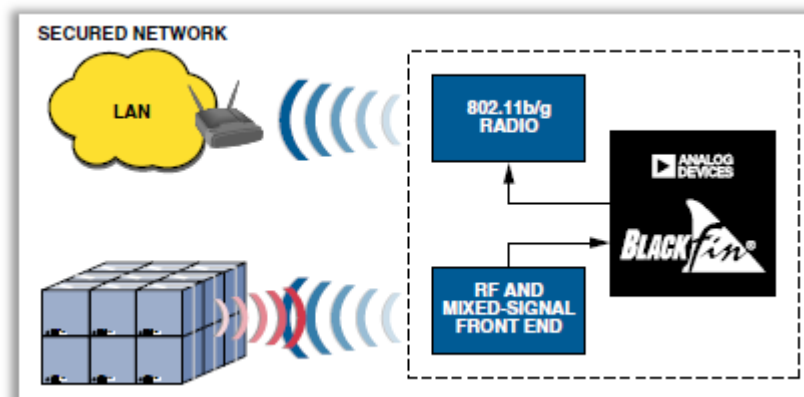
2. Katz

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, 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.

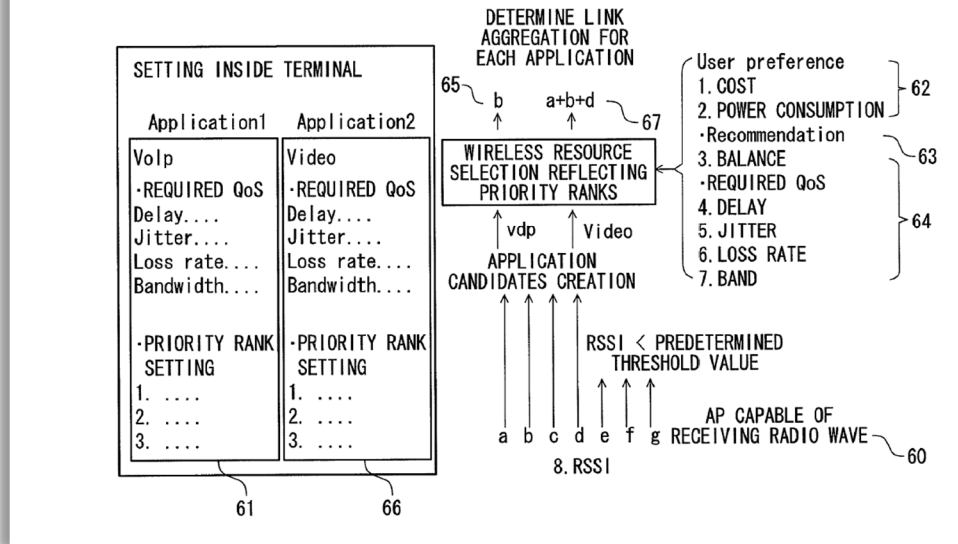
Katz's Blackfin processor executes software to filter and transform radio signals as well as translate and filter the outputted data. Ex. 1006, 2–3. Katz also employs ADC/DACs in its radio frequency front end to transform radio signals between the analog and digital domains. *Id.* at 3.

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 (e.g., SDRs), 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.

FIG. 6



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

Claims 6 and 15 should be construed in the disjunctive, such that the claim requires only one of the claimed methods of calculating the “value of said user-defined criterion.” *See, e.g., SkinMedica, Inc. v. Histogen Inc.*, 727 F.3d 1187, 1199 (Fed. Cir. 2013) (“The disjunctive ‘or’ plainly designates that a series describes

alternatives.”); *see also Wasica Finance GmbH v. Continental Automotive Sys, Inc.*, 853 F.3d 1272, 1280 (Fed. Cir. 2017) (affirming the PTAB’s determinations that “or” broadened a claim to include “electrical pressure signal” not limited to numerical values and that the prior art teaching of non-numerical expressions of pressure practiced the limitation).

Claim 6 recites “wherein said value of said user-defined criterion is calculated as a weighted sum of components *or* as a square root of a weighted sum of squares” and further claims “as one of” four different algorithms for calculating the user-defined criterion. The disjunctive use of the connector “or” and the clause “one of,” indicates to a POSITA that the claim intends to cover any one of these algorithms as a separate option. *Cf. Intervet Inc. v. Merial Ltd.*, 617 F.3d 1282, 1291 (Fed. Cir. 2012) (discussing that the claim required only one of thirteen options and was disclosed by a prior art reference teaching one of the thirteen). Thus, the prior art need only teach one of the algorithms.

Similarly, claim 15 recites “wherein one of” and then recites each of the four-different algorithms. Accordingly, like claim 6, claim 15 intends to cover these algorithms as separately claimed alternatives, for which the prior art need only teach one.

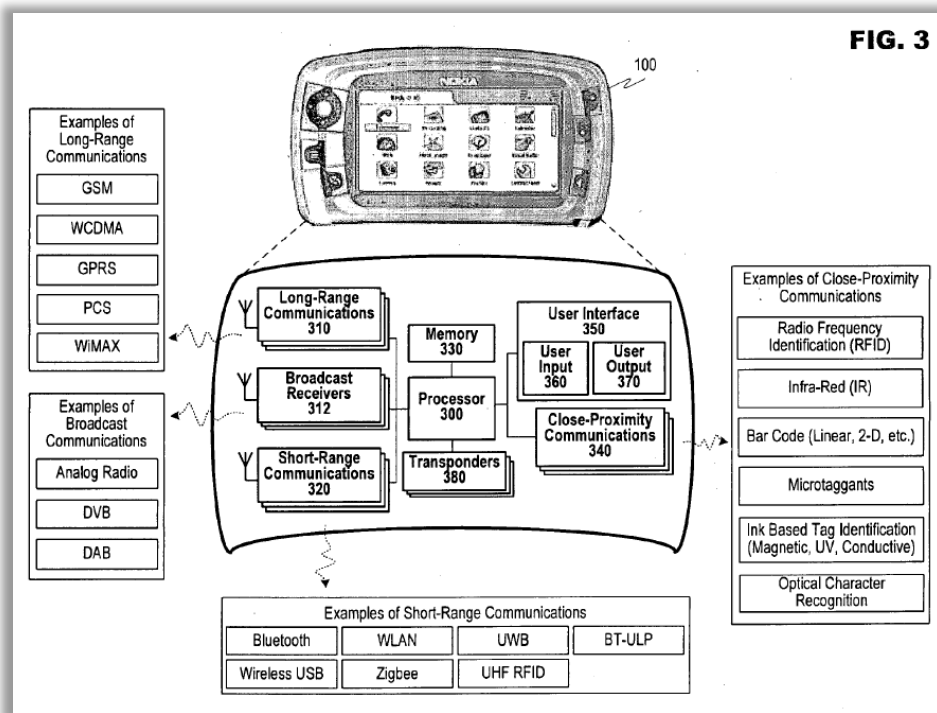
V. GROUND 1: Anticipation of Challenged Claims 1–20 by Tolonen

A. Tolonen Invalidates the Claims

1. Claim 1

(a) *1[pre] Tolonen discloses “[a]n apparatus comprising.”*

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 a bar code reading device, to interface with other devices. Tolonen ¶¶ 50–57, Fig. 3.



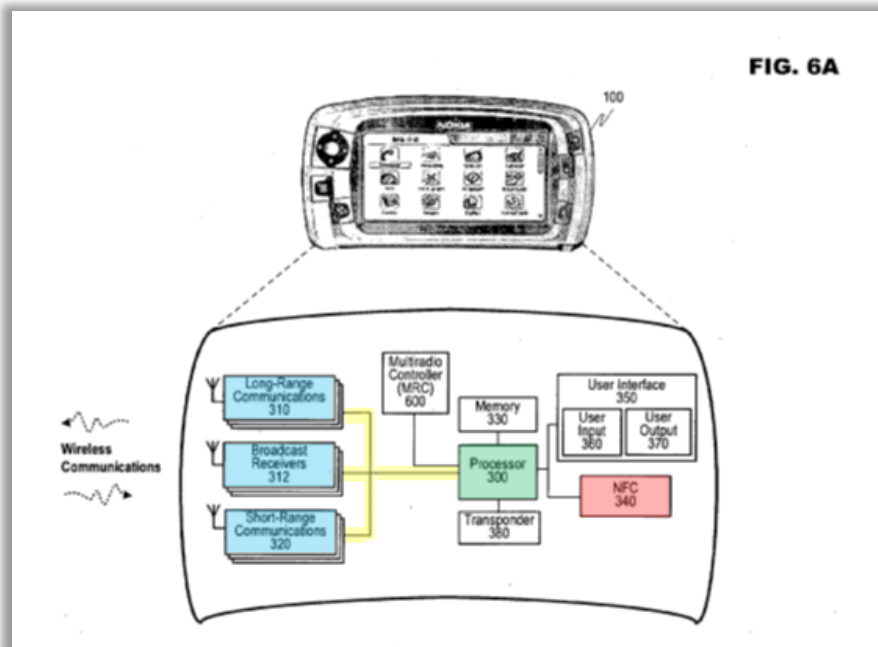
Tolonen, Fig. 3

(b) *1[A] Tolonen's apparatus comprises "a microprocessor."*

Tolonen's WCD 100 includes processor 300, "or [optionally] one or more microprocessors," which are responsible for "control[ing] overall device operation" and "executing software instructions stored in memory 330." Tolonen, ¶ 50; *see also id.* ¶¶ 52, 59, 71–73, Fig. 8A.

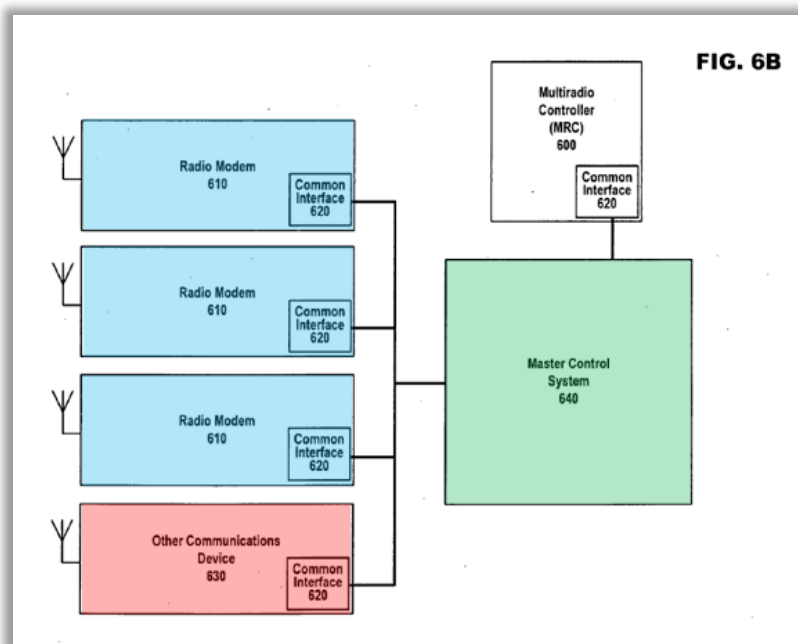
(c) *1[B] Tolonen's apparatus comprises "a wireless communication interface configured to perform at least one of receiving a first radio signal or transmitting a second radio signal, said wireless communication interface electrically coupled to at least one of an analog-to-digital converter (ADC) or a digital-to-analog converter (DAC)."*

Tolonen's communication modules 310, 312, and 320 ("communication modules") include wireless communication interfaces that each 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). These communication modules are inherently coupled to an ADC and DAC. Ex. 1003, ¶¶ 64–66.



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

In connection with Figure 6A above, Figure 6B below illustrates Tolonen's communication modules as “radio modems.”

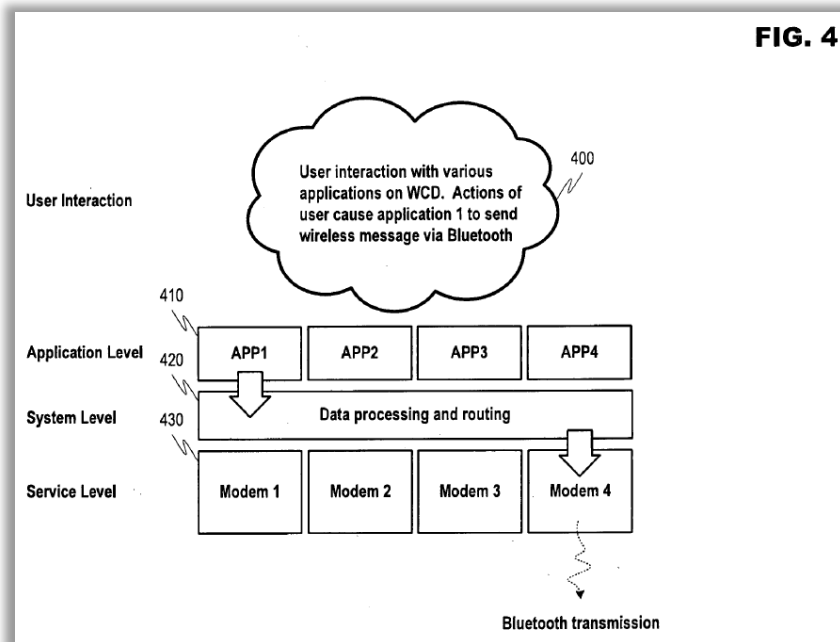


Ex. 1005, Fig. 6B (annotated).

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, ¶¶ 67-72. 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 communication modules. *See* Ex. 1003, ¶¶ 67-72 (explaining that Tuttlebee's long-range communication modules, which communicates according to GSM, necessarily includes an ADC and DAC coupled to an RF Front end).

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 digital data to the communication modules through the system bus for transmission through an RF Front end and antenna (e.g., through analog radio signals). *See* Ex. 1003, ¶ 73.



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 ADC and a DAC. *See* Ex. 1003, ¶¶ 67-72 (citing Ex. 1012, Figs. 1.4 and 1.5); *see also*, Ex. 1005, ¶¶ 89-98.

- (d) *1[C] 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, ¶ 76 (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, ¶ 76.

- (e) *1[D] 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.(d). These processes are examples of data encoding, which produces an encoded bit stream. Ex. 1003, ¶ 77. Additionally, Tolonen teaches that wireless communications are encoded for security. Ex. 1005, ¶¶ 40, 54.

(f) *1[E] Tolonen's "DAC is configured to output 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. *Supra* Section V.A.1.(c)–(e). 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. 1003, ¶ 78 (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, ¶ 78. Additionally, Tolonen teaches that wireless communications are encoded for security. Ex. 1005, ¶¶ 40, 54.

(g) *1[F] Tolonen's "ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said wireless communication interface."*

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.(c)-(f). 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, ¶ 79; *see also*, Ex. 1005, ¶¶ 40, 54 (encoding communications for security);

(h) *I[G] 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.(c)-(g). 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, ¶ 80. 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, ¶ 80.

2. Claim 2

- (a) *Tolonen’s “apparatus 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, or 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.” Tolonen, ¶ 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.” Tolonen, ¶ 89–91.

3. Claim 3

- (a) *Tolonen's "base-band encoder software program and ... base-band decoder software program are implemented as a single software program."*

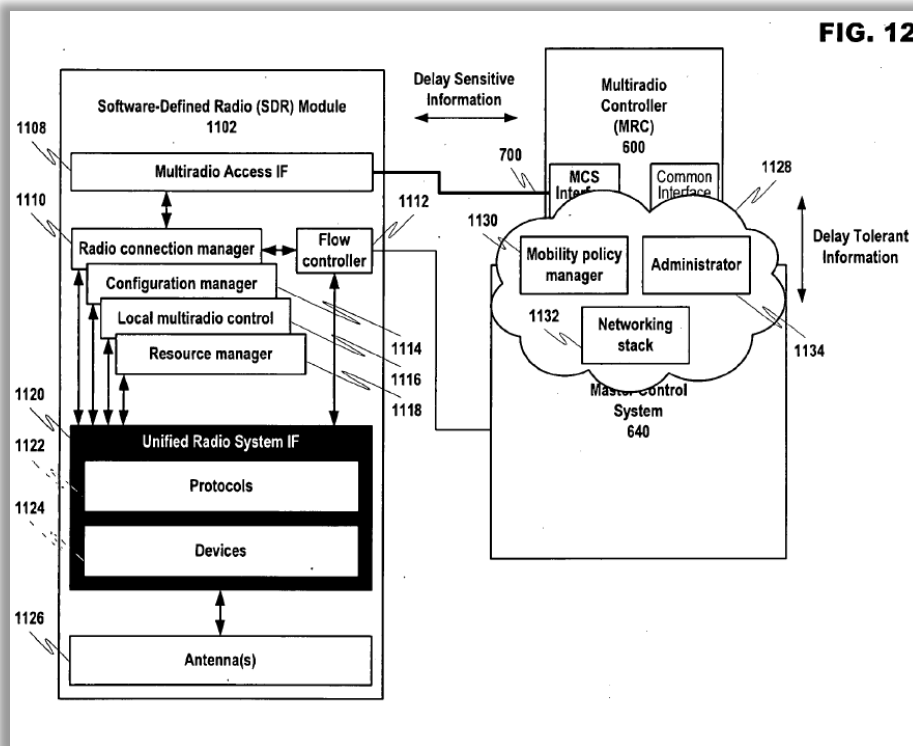
Tolonen stores its overall WCD operation software, "specialized software modules configured to manage particular functions such as communications modules," and application-related software modules on the WCD's memory. Tolonen, ¶ 52. Examples of the software modules include "communication utilities modules required to support WCD," "for example, the calculation, translation, conversion and/or packetizing [of] data" for transmission. *Id.* ¶¶ 52, 62.

A POSITA would recognize that software modules may either be standalone or implemented as part of a single software program. Ex. 1003, ¶ 83. A POSITA would further understand that either implementation would constitute an obvious choice that would result in essentially the same predictable solution. Ex. 1003, ¶ 83.

4. Claim 4

- (a) Tolonen discloses “[t]he apparatus 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, or 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*).

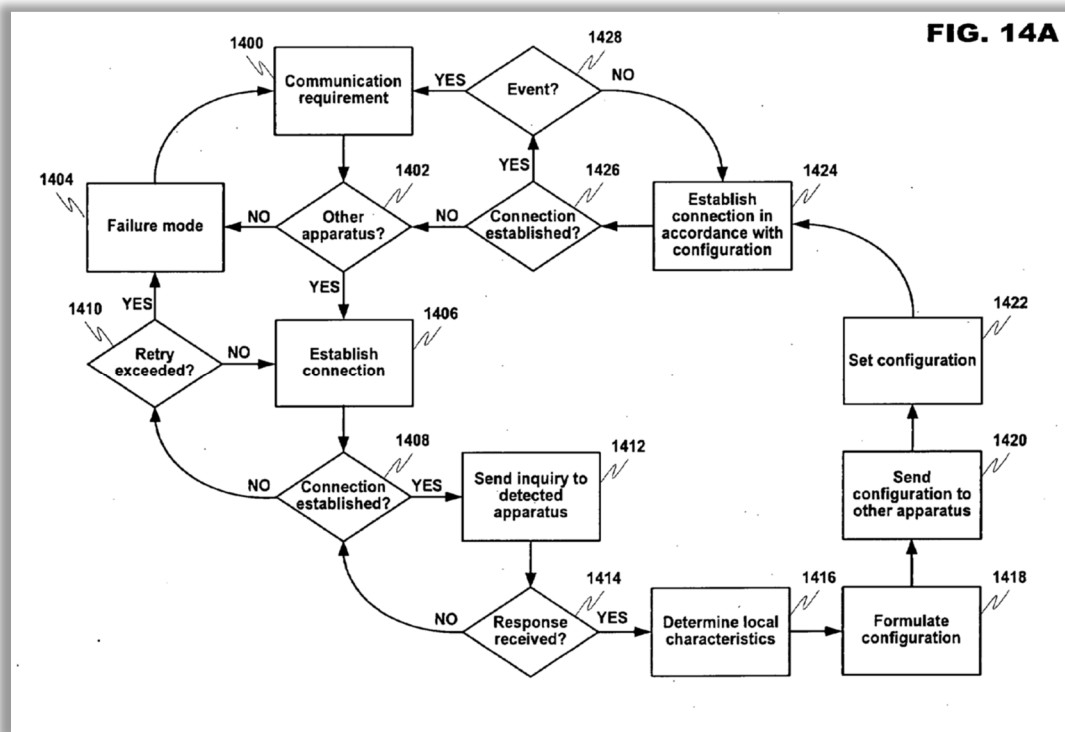


Ex. 1005, Fig. 12.

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.

5. Claim 5

- (a) Tolonen discloses “[t]he apparatus of claim 4, 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, or 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).

6. Claim 6

As set forth above with respect to claim 6’s construction, claim 6 requires satisfaction of only one of the claimed algorithms. Tolonen teaches “[t]he apparatus of claim 4, wherein said value of said user-defined criterion is calculated as a weighted sum of components” wherein “at least one of said components represented by at least one of a 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).

Although Tolonen does not expressly teach that the mobility policy manager performs a weighted sum of these characteristics in setting the policy for the radio configuration, a POSITA would have determined the weighted sum an obvious means for determining the best way of satisfying the user’s preference taught by Tolonen. Ex. 1003, ¶¶ 90-91. Indeed, the “weighted sum model ... is the earliest and probably the most widely used method” for multi-criteria decision making. *See* Ex. 1019, 3; *see also* Ex. 1003, ¶ 90.

A POSITA would have realized that choosing the weighted sum model (“WSM”) would predictable accomplish Tolonen’s goal of setting a policy based on user-defined characteristics. Ex. 1003, ¶ 91. According to the WSM model, Tolonen’s radio transport alternatives would be represented by M, and each of the criteria (e.g., error correction, Quality of Service, power saving, high speed, etc.) would represent N criteria. Ex. 1003, ¶ 91. The figure below represents the calculation that would be performed using the WSM.

4.2.1 The Weighted Sum Model

The weighted sum model (or WSM) is probably the most commonly used approach, especially in single dimensional problems. If there are M alternatives and N criteria then, the best alternative is the one that satisfies (in the maximization case) the following expression [Fishburn, 1967]:

$$A_{WSM}^* = \max_i \sum_{j=1}^N a_{ij} w_j, \quad \text{for } i = 1, 2, 3, \dots, M. \quad (4-1)$$

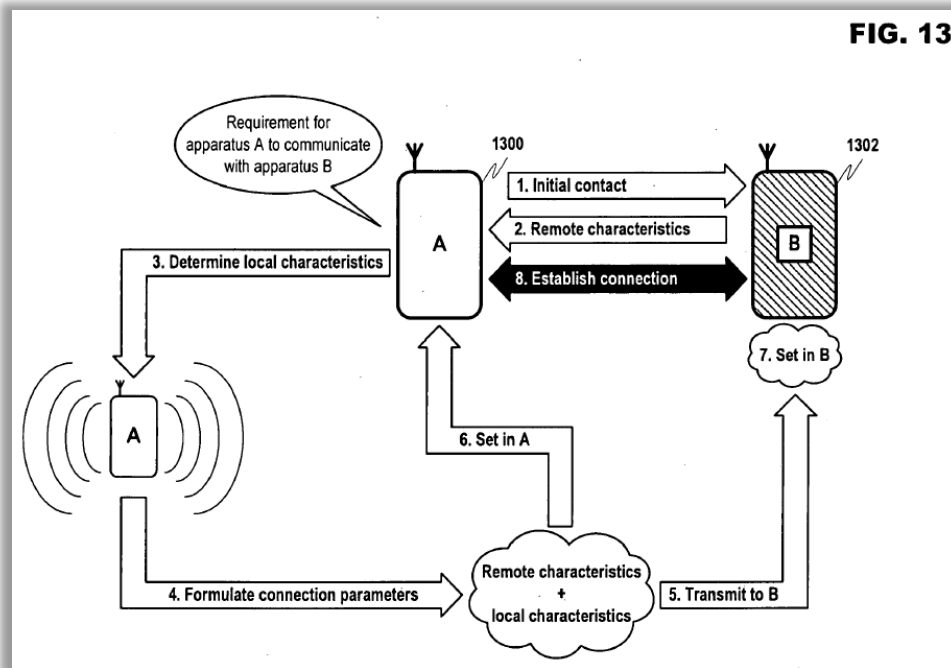
where: A_{WSM}^* is the WSM score of the best alternative, N is the number of decision criteria, a_{ij} is the actual value of the i -th alternative in terms of the j -th criterion, and w_j is the weight of importance of the j -th criterion.

Ex. 1019, 3.

7. Claim 7

- (a) *Tolonen discloses “[t]he apparatus of claim 4, wherein said apparatus 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)

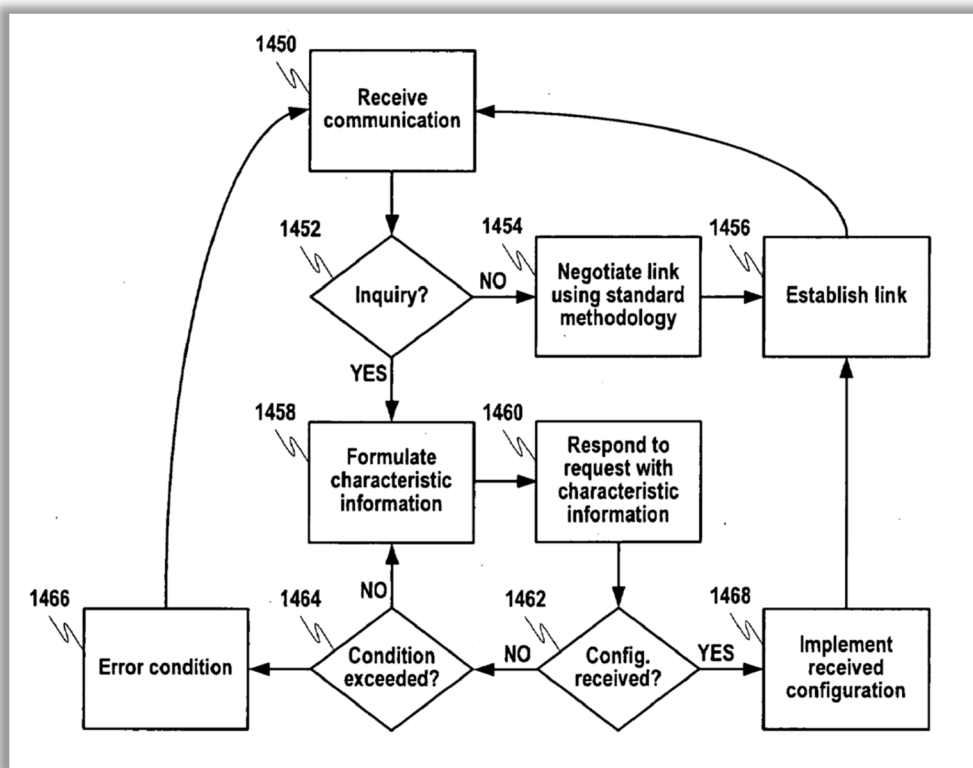
requirements, operational schemes (e.g., power saving, high speed, etc.), [and] radio module priority.” *Id.* ¶ 102.

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, ¶ 94 (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.* ¶¶ 105–07; *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.

8. Claim 8

(a) *Tolonen discloses “[t]he apparatus of claim 4, wherein said apparatus is configured to evaluate said user-defined criterion before attempting to initiate a communication session.”*

1. As discussed previously, using characteristic information (based on user-defined criteria) such as “Quality of Service (QoS) requirements, operational schemes (e.g., power saving, high speed, etc.), [and] radio module priority”, Tolonen’s WCD formulates a configuration for the SDR. Tolonen, ¶¶ 95, 102; *see also supra* Section V.A.5.a. Although Tolonen’s WCD may evaluate the characteristic information after receiving an initial wireless inquiry, as shown in Figure 14B, “[t]he formulation of characteristic information may also occur *before* receiving the inquiry.” Tolonen, ¶ 111. *see also* ¶ 102 (explaining that “the determination of local characteristics may occur before, during or after the receipt of remote characteristics from apparatus B 1302”). Tolonen further teaches that only after the formulation of the configuration for the communication section is complete (i.e., only after the user-defined criterion are evaluated) is the configuration sent to the second apparatus (i.e., apparatus B 1302). Ex. 1005, ¶ 103. Only after both apparatus A and apparatus B have set their configurations “either apparatus may initiate communication (e.g., establish a wireless link between apparatuses).” Ex. 1005, ¶ 103. Thus, the user-defined criteria are evaluated before attempting to initiate a communication session.



Tolonen, Fig. 14B.

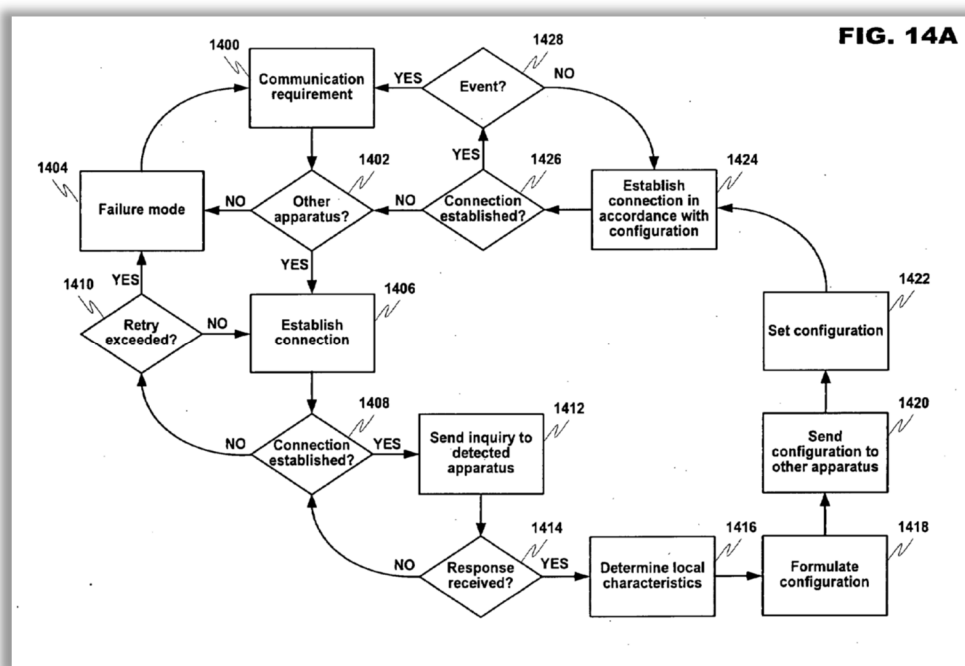
9. Claim 9

- (a) *Tolonen discloses “[t]he apparatus of claim 4, wherein said apparatus 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 that signal interference issues arise when communicating using multiple communication protocols simultaneously on multiple modems. Ex. 1005, ¶¶ 63–64. For example, because Bluetooth, WLAN, and wireless USB all operate on the 2.4 GHz band, substantial overlap can occur. Ex. 1005, ¶ 64. This

overlap causes interference, which results in the loss of packets and diminishes signal quality and efficiency. Ex. 1005, ¶ 64.

To remedy the interference, Tolonen teaches that the “[multiradio controller] may schedule communication in a multiradio system.” Ex. 1005, ¶ 97. But beyond scheduling communications, Tolonen also contemplates that communications may need to be switched mid transmission. For example, Tolonen’s figure 14 illustrates a process by which a communication apparatus may define a new communication configuration whenever an event, (e.g., “fulfillment of the communication requirement, a loss of wireless connection between the apparatuses that could conflict with current communication, a status change in either apparatus (e.g., power deletion)) necessitates such a change. Ex. 1005, ¶ 104.



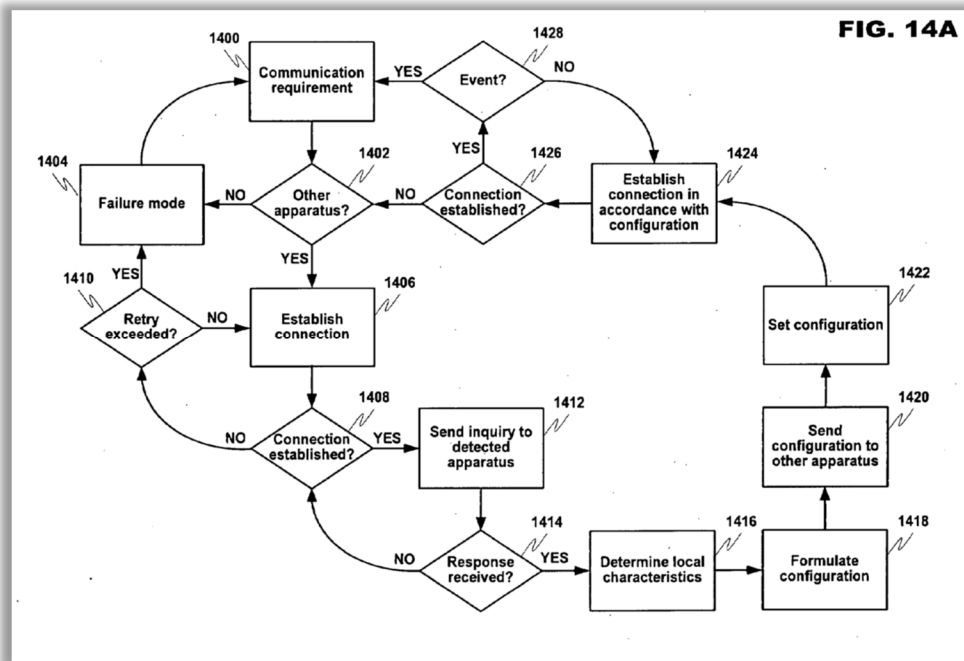
Tolonen, Fig. 14

In redefining the communications, Tolonen performs the steps I describe with respect to claims 5 and 7, *see supra* V.A.5, V.A.7. Accordingly, the configuration is according to a user preference. Ex. 1003, ¶¶ 96-97.

10. Claim 10

- (a) *Tolonen discloses “[t]he apparatus of claim 4, said apparatus is configured to evaluate said user-defined criterion responsive to a pre-defined event.”*

As described previously, Tolonen’s WCD can dynamically switch communication configuration mid-transmission. Tolonen, ¶¶ 97, 109. For example, as shown below in figure 14, Tolonen illustrates a process by which a communication apparatus may define a new communication configuration whenever a *predefined event*, (e.g., “fulfillment of the communication requirement, a loss of wireless connection between the apparatuses that could conflict with current communication, a status change in either apparatus (e.g., power deletion)) necessitates such a change. Tolonen, ¶¶ 104, 109.



Tolonen, Fig. 14

11. Claim 11

- (a) *Tolonen discloses “[t]he apparatus of claim 4, said apparatus is configured to periodically evaluate said user-defined criterion.”*

As discussed previously, using characteristic information (based on user-defined criteria) such as “Quality of Service (QoS) requirements, operational schemes (e.g., power saving, high speed, etc.), [and] radio module priority”, Tolonen’s WCD formulates a configuration for the SDR. Tolonen, ¶¶ 95, 102; *see also supra* Sections V.A.5-10. Although Tolonen’s WCD may evaluate the characteristic information before or after receiving an initial wireless inquiry, “[t]he

formulation of characteristic information may also occur . . . *periodically*.” Tolonen, ¶ 111.

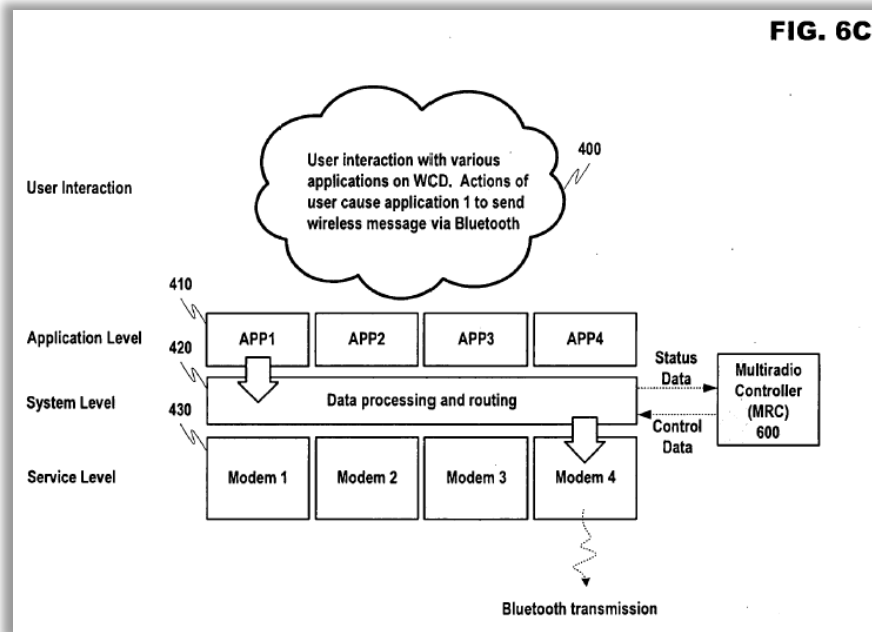
12. Claim 12

(a) *Tolonen’s “apparatus of claim 1 [is] further configured to dynamically select at least one of a wireless communication network, a wireless communication protocol, or 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, ¶¶ 101-103.

13. Claim 13

Except that claim 13 does not require that the wireless communication interface includes either an ADC or DAC, claim 13 is identical to claims 1 and 4.

Accordingly, Claim 13 is anticipated by Tolonen for the same reasons set forth for claim 1 and 4.

14. Claims 14, 16-18

Claims 14 and 16-18 are identical to claims 3 and 7-9, except that claims 14 and 16-18 depend from claim 13; whereas claims 3 and 7-9 depend from claim 1. Accordingly, claims 14 and 16-18 are anticipated by Tolonen for the same reasons set forth for claims 3 and 7- 9.

15. Claim 15

- (a) *Tolonen discloses “[t]he apparatus of claim 13, wherein one of 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, or communication channel throughput.”*

Claim 15 is identical to Claim limitation 6, with the only substantive difference being that Claim 15 depends from Claim 13 whereas Claim 5 depends from Claim 4—both of which are anticipated by Tolonen.¹ Accordingly, Tolonen teaches Claim limitation 15[A] for the same reasons. *See supra* Sections V.A.4, V.A.13.

¹ The preambles of claim 6 and 15 are different, but when construed, both claim the same “one of” equations for calculating the value of the user-defined criterion.

16. Claim 19

- (a) *Tolonen discloses “[t]he apparatus of claim 13, wherein said apparatus is configured to periodically evaluate said user-defined criterion or evaluate said user-defined criterion responsive to a pre-defined event.”*

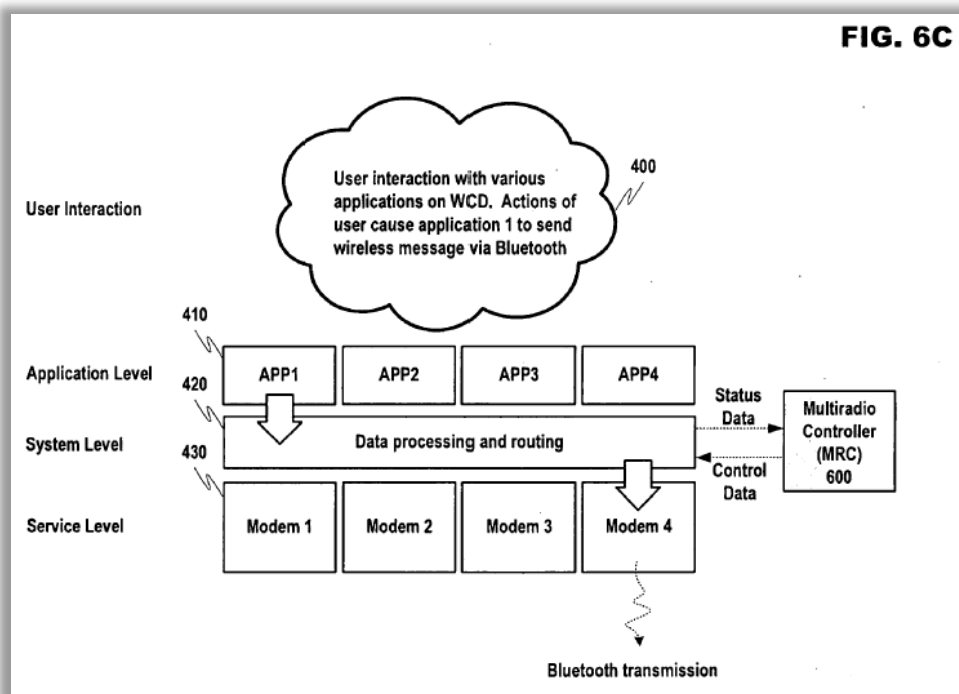
Claim 19 is a mere alternative combination of Claims 10 and 11. Otherwise the only difference is that claim 19 depends from claim 13, whereas claims 10 and 11 depend from claim 4. Accordingly, claim 19 is anticipated by Tolonen for the same reasons set forth for either claim 10 or claim 11.

17. Claim 20

- (a) *Tolonen’s “apparatus of claim 13 [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.”*

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, ¶¶ 108-10

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, ¶ 111.

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, ¶ 112. 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.* ¶ 112.

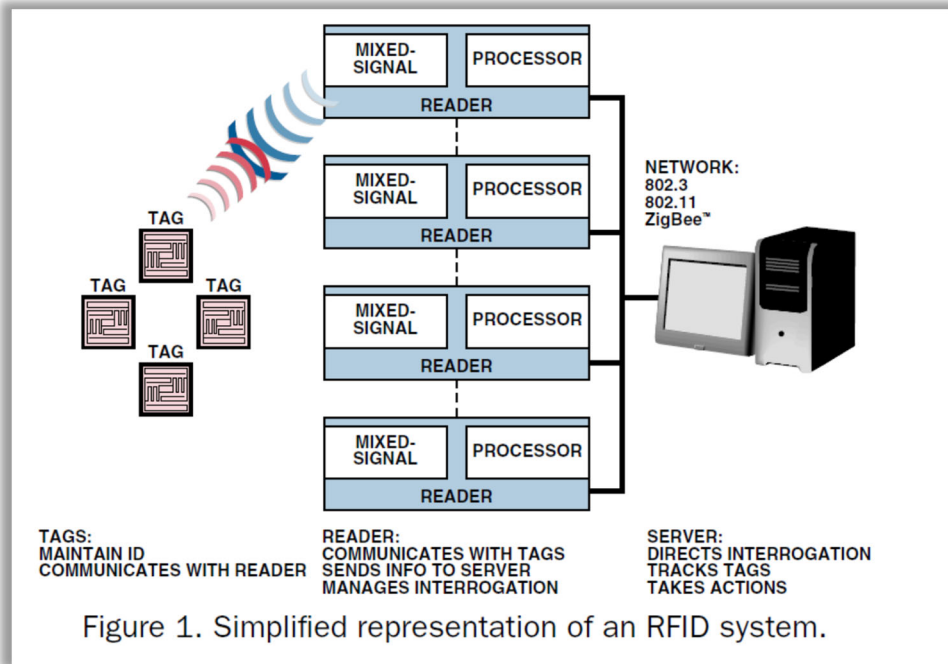
VI. GROUND 2: Anticipation of Claims 1–3 over Katz.

A. Katz invalidates the claims.

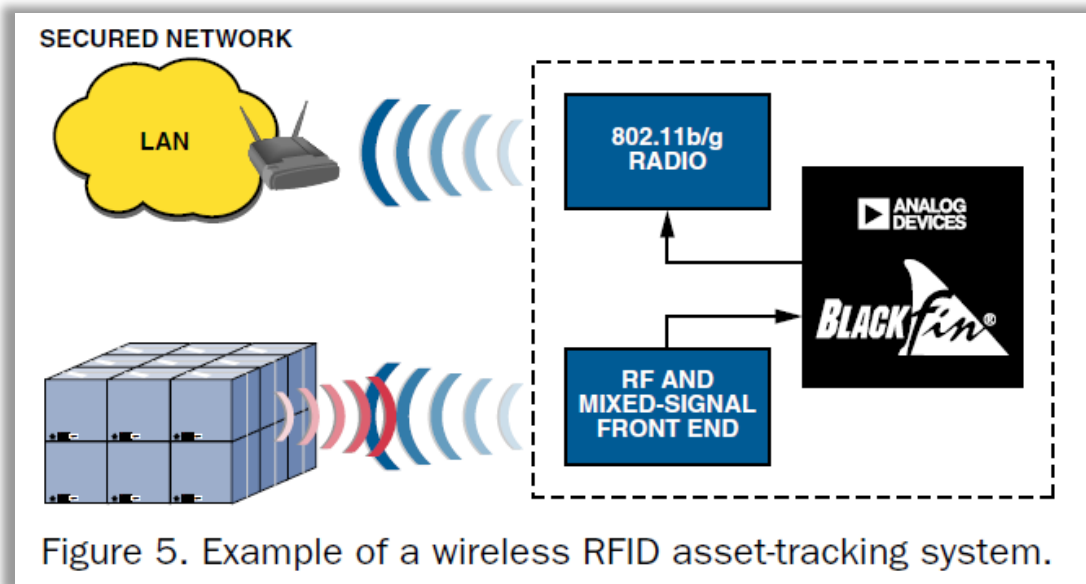
1. Claim 1

(a) I[pre] Katz discloses “[a]n apparatus comprising.”

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



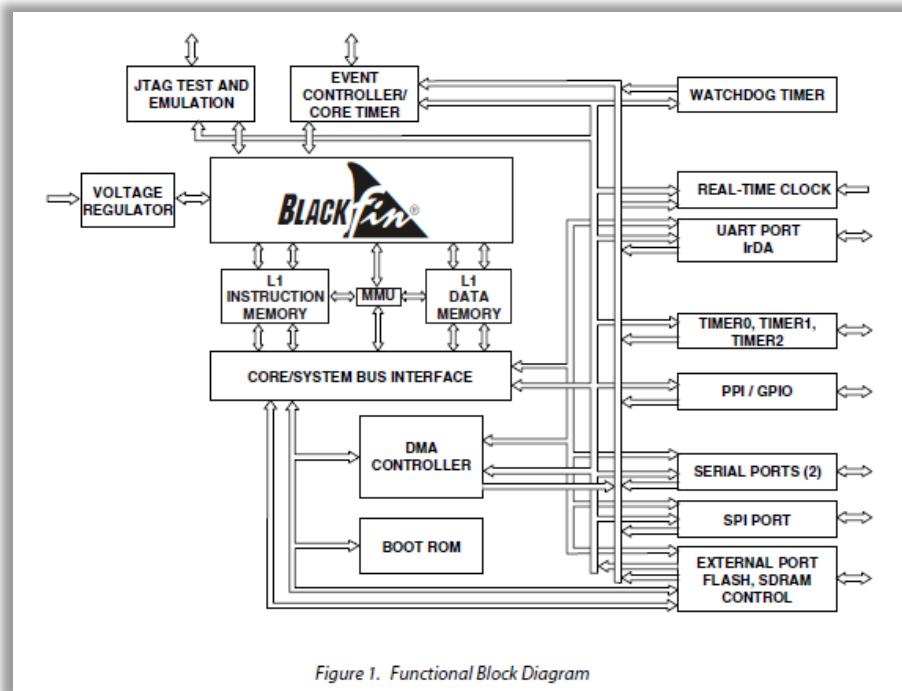
Katz, Fig 1



Katz, Fig. 5

(b) 1[A] Katz's apparatus comprises "a microprocessor."

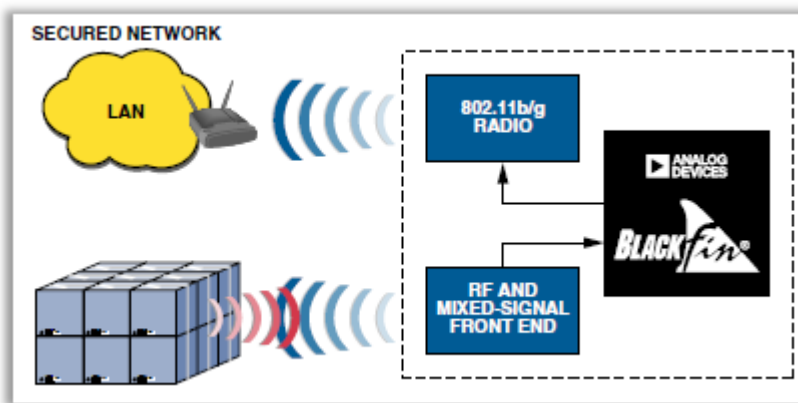
Katz's RFID system includes a Blackfin embedded processor that is connected peripherals via "several high bandwidth buses." Ex. 1006, 3–4; Ex. 1007, 1, 4; Ex. 1003, ¶ 114 (explaining that an embedded processor is a microprocessor designed for an embedded system). Katz's Blackfin processor combines a signal processing engine with RISC-like microprocessor instruction sets. Ex. 1007, 4; Ex. 1003, ¶ 114 (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, 4, Fig. 1.



Ex. 1007, Fig 1.

- (c) *1[B] Katz's apparatus comprises "a wireless communication interface configured to perform at least one of receiving a first radio signal or transmitting a second radio signal, said wireless communication interface electrically coupled to at least one of an analog-to-digital converter (ADC) or a digital-to-analog converter (DAC)."*

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, 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 ADC and DAC. *See* Ex. 1003, ¶¶ 115-119 (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 wireless communication interface, 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, ¶ 120.

- (d) *1[C] Katz’s “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, 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, ¶ 121.

- (e) *1[D] 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, 2–3; *see supra* Section VI.A.1(b)–(d); *see also*, Ex. 1003, ¶ 122 (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, 4; Ex. 1003, ¶ 122.

(f) *1[E] 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, 3; *see supra* Section VI.A.1(c)-(d). 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, ¶¶ 123-24.

(g) *1[F] Katz's "ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said wireless communication interface."*

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, 3; *see supra* Section VI.A.1(c)-(f). 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, ¶¶ 125-26.

- (h) *1[G] 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, 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, 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, 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, 4; Ex. 1003, ¶ 127.

2. Claim 2

- (a) *Katz’s “apparatus 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, or 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, 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, ¶ 128.

3. Claim 3

- (a) *Katz’s “base-band encoder software program and ... base-band decoder software program are implemented as a single software program.”*

Katz’s RFID readers “has embedded software that manages the interrogation, decoding, and processing of the received tag information.” Katz, at 1–2. All “three

elements” of this RFID reader’s embedded software architecture—“the back-end server interface, the middleware, and the front-end tag reader algorithms”—concurrently run on Katz’s Blackfin processor. Katz, at 1–2. A POSITA would recognize that software architectures may either be standalone or implemented as part of a single software program. Ex. 1003, ¶ 130. A POSITA would further understand that either implementation would constitute an obvious choice that would result in essentially the same predictable solution. Ex. 1003, ¶ 130.

VII. GROUND 3: Obviousness of Claims 4-20 over Katz in further view of Ishizu.

A. Motivation to Combine

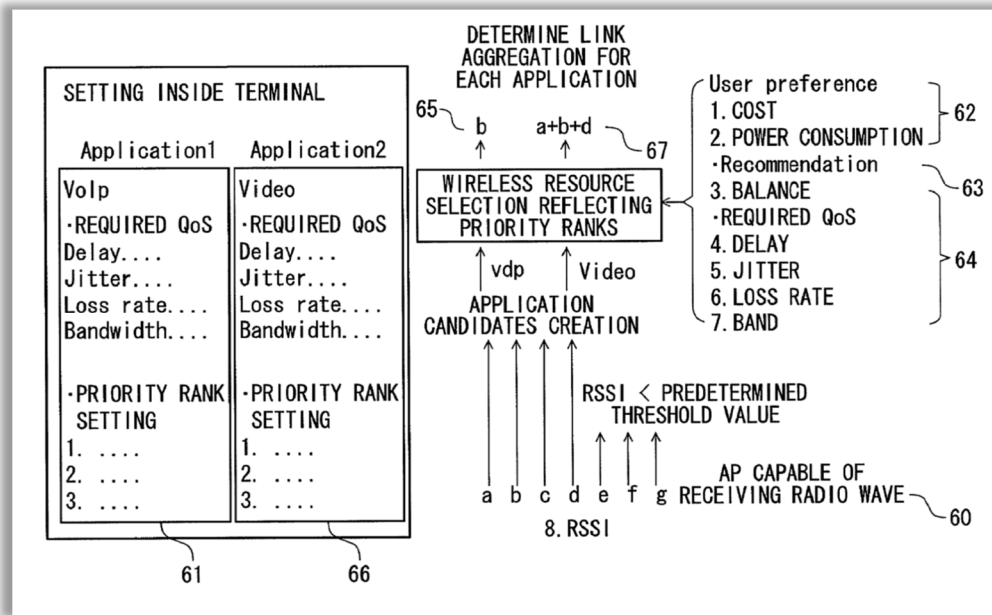
A POSITA would have been motivated to combine Katz with Ishizu. Ex. 1003, ¶¶ 131-36.

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, 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 µClinux 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, ¶ 134. 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, 4; Ex. 1003, ¶ 136. 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

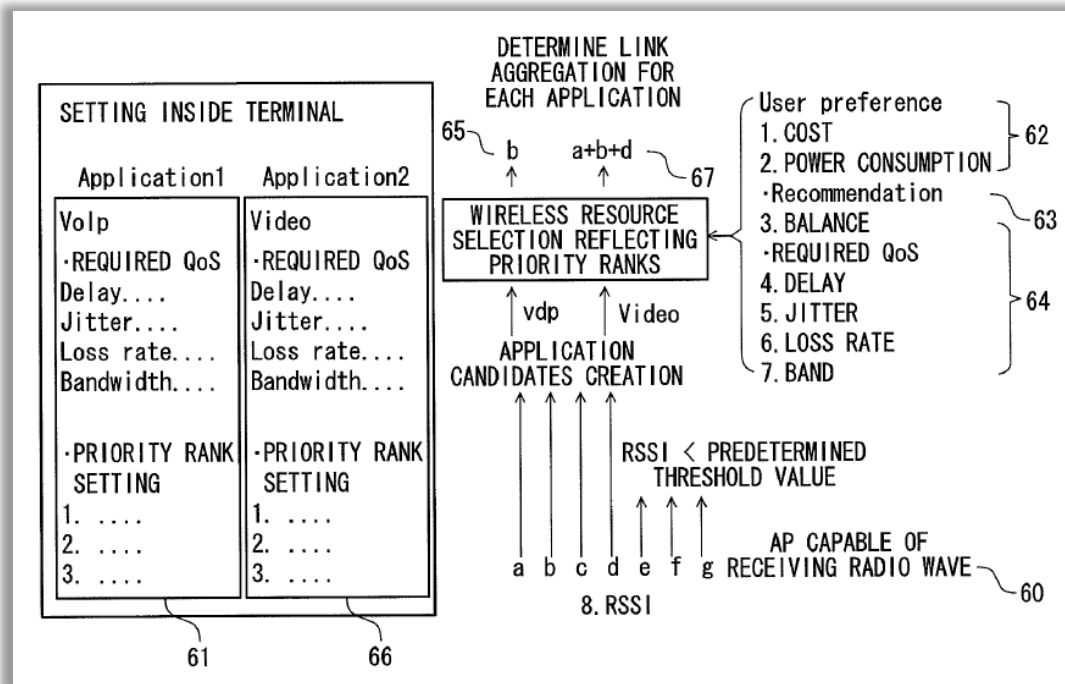
described by Katz that relies on the connection policy methodologies described by Ishizu. *Id.*

B. Katz in view of Ishizu Invalidates the Claims

1. Claim 4

- (a) *Katz in view of Ishizu discloses “[t]he apparatus 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, or 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 VII.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.



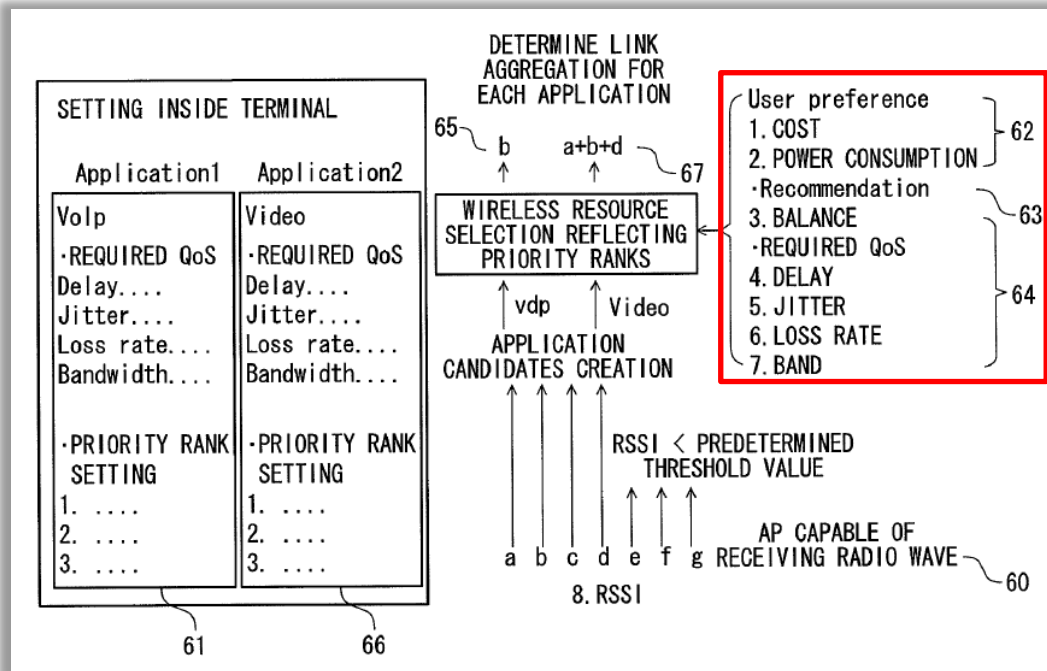
Ex. 1010, Fig. 6.

2. Claim 5

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, 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, or 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 VII.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 6

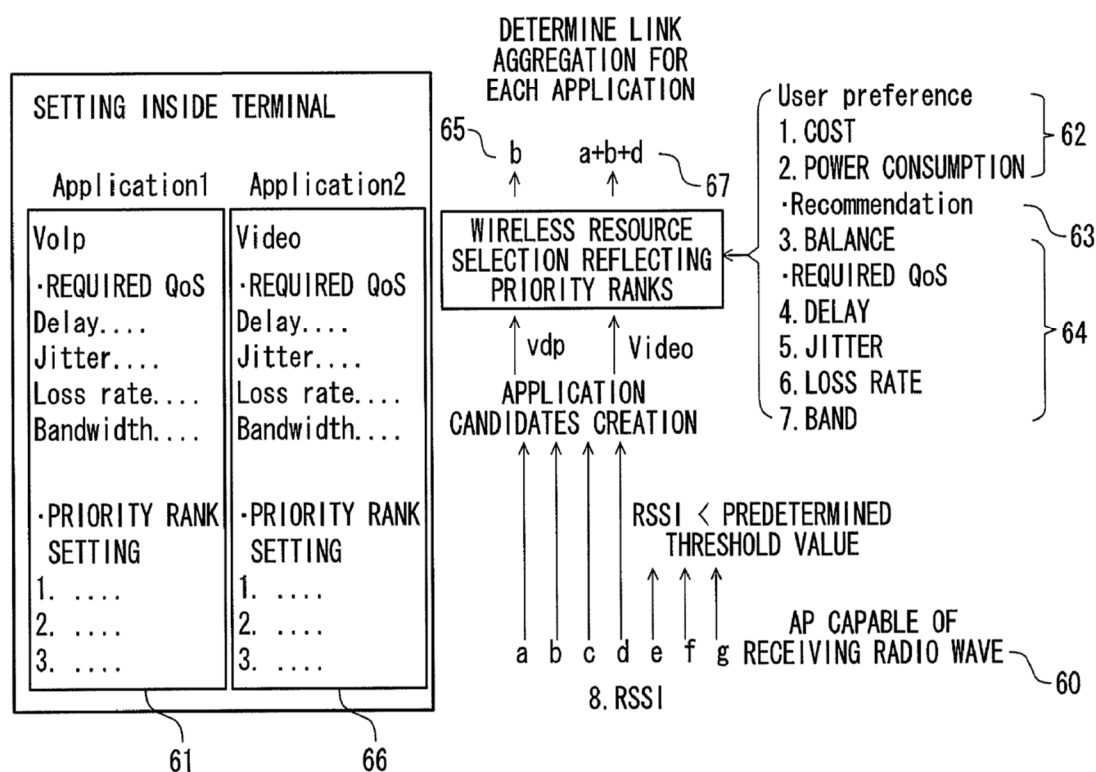
- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, wherein said value of said user-defined criterion is calculated as a weighted sum of components” wherein at least one of said components represented by at least one of a network status, communication quality, signal strength, service cost, bandwidth, a user preference, and communication channel throughput.”*

Ishizu’s apparatus calculates a balance to maximize user satisfaction based on user requirements and required Quality of Service factors. Ex. 1010, ¶ 147. In every wireless resource selection, Ishizu aims to maximize user satisfaction—defined as “an evaluation value expressing subjective satisfaction.” Ex. 1010, ¶¶ 137, 143. For example, “[i]n addition to a requirement (62) and a required QoS (64), a balance (63) of the above-mentioned user satisfaction” is calculated to select a wireless resource. Ex. 1010, ¶ 147.

Specifically, to select a communication network, Ishizu first selects access points that meet the Quality of Standard factors as plausible selection candidates and then narrows the selection candidates to those who meet the “cost requirement and power consumption requirement of the user.” Ex. 1010, ¶ 147. “If two or more selection candidates remain, the balance (63) is considered.” Ex. 1010, ¶ 149. As shown below in Figure 6, Ishizu’s device must determine which factors are more important than others to calculate and employ a balance. Ex. 1003, ¶ 140. Ishizu describes that “in the case of video streaming, for example, some users are not

satisfied by saying ‘what a poor image quality for that amount of fee’, while other users are well satisfied by saying ‘how good the image quality is for a mobile’ with video reproduction with the same evaluation point.” Ex. 1010, ¶ 141.

FIG. 6



Ex. 1010, Fig. 6.

To calculate a balance using multiple user requirements and Quality of Service factors, it would have been obvious for Ishizu’s device to employ a weighted sum calculation. Ex. 1003, ¶ 141. Ishizu must employ a weighting system for user requirement and quality of service if Ishizu is to balance a user’s satisfaction with

the Quality of Service Factors. a POSITA would have determined the weighted sum an obvious means for accomplishing this balance. Indeed, the “weighted sum model ... is the earliest and probably the most widely used method” for multi-criteria decision making. *See* Ex. 1019, 3.

A POSITA would have realized that choosing the weighted sum model (“WSM”) would predictably accomplish Ishizu’s goal of determining network communication link based on user satisfaction. Ex. 1003, ¶ 142. According to the WSM model, Ishizu’s communication link alternatives would be represented by M , and each of the criteria (e.g., QOS, delay, jitter, loss rate, bandwidth etc.) would represent N criteria. Ex. 1003, ¶ 142. The figure below represents the calculation that would be performed using the WSM.

4.2.1 The Weighted Sum Model

The weighted sum model (or WSM) is probably the most commonly used approach, especially in single dimensional problems. If there are M alternatives and N criteria then, the best alternative is the one that satisfies (in the maximization case) the following expression [Fishburn, 1967]:

$$A_{WSM}^* = \max_i \sum_{j=1}^N q_{ij} w_j, \quad \text{for } i = 1, 2, 3, \dots, M. \quad (4-1)$$

where: A_{WSM}^* is the WSM score of the best alternative, N is the number of decision criteria, q_{ij} is the actual value of the i -th alternative in terms of the j -th criterion, and w_j is the weight of importance of the j -th criterion.

Ex. 1019, 3.

4. Claim 7

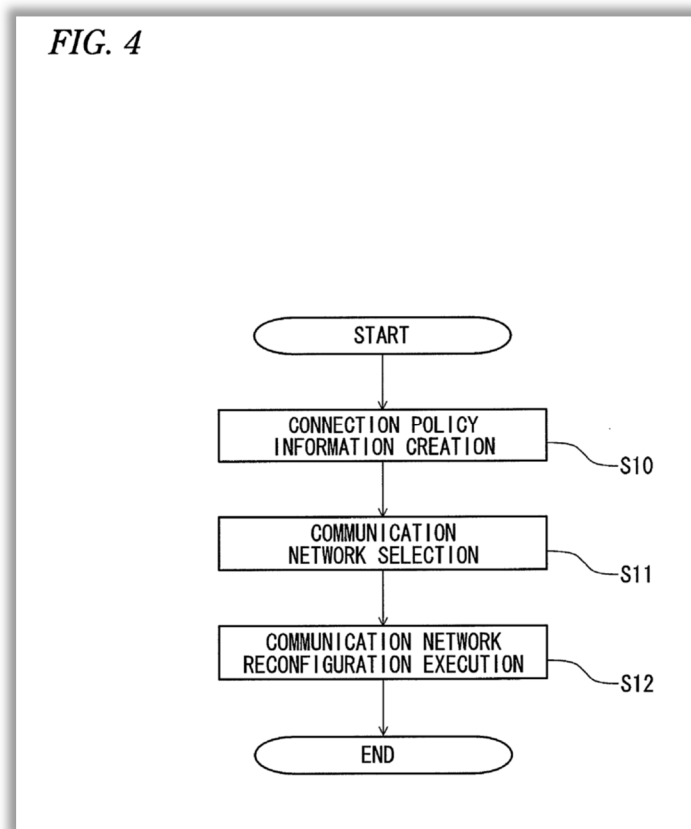
- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, wherein said apparatus is configured to search beacon signals over a pre-defined frequency range, and then select at least one of a wireless communication network and frequency channel which optimizes said user-defined criterion.”*

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 VII.A. 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.

5. Claim 8

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, wherein said apparatus is configured to evaluate said user-defined criterion before attempting to initiate a communication session.”*

Ishizu’s data communication aggregation device evaluates user preference and transmission requirements to create connection policy information and select a wireless network. Ishizu, ¶¶ 75–95. As shown below in Figure 4, Ishizu’s device creates the connection policy information *before* selecting and initiating communication with a wireless network. *Id.*



Ex. 1010, Fig. 4.

6. Claim 9

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, wherein said apparatus 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 VII.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.” Ishizu, ¶ 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. Ishizu, ¶ 147; *see also supra* Section VII.B.4-VII.B.8. Using the device’s communication network reconfiguration executing means, the device then switches to the selected connection method. Ishizu, ¶ 38.

7. Claim 10

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, said apparatus is configured to evaluate said user-defined criterion responsive to a pre-defined event.”*

As described previously, Ishizu teaches a selection algorithm and reconfiguration means, based on the connection policy information, to dynamically select a wireless network. Ishizu, ¶ 38; *see supra* Section VII.B.1. Connection policy information—comprised of requirement information from the user and the communication parameters—can contain predetermined threshold values. Ishizu, ¶¶ 39–41. When one of the predetermined threshold values is not satisfied, Ishizu’s device reevaluates the connection policy information and reconfigures the connection to select a different wireless network responsive to the failure of meeting the predetermined threshold values. *Id.*; Ex. 1003, ¶ 146 (explaining that failing to meet threshold values is a form of event triggering a response in software architecture).

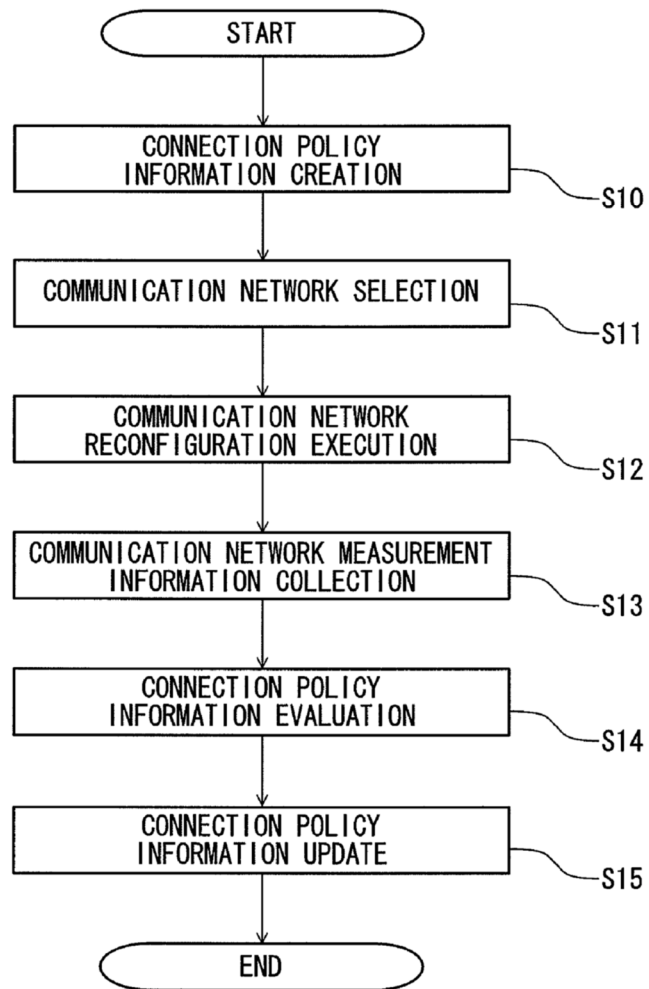
8. Claim 11

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 4, said apparatus is configured to periodically evaluate 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 VII.A. Ishizu's device constantly reconfigures wireless network connections to ensure the selected wireless network always adheres to user preference and connection requirements. Ishizu, ¶¶ 16, 157. To accomplish this, Ishizu teaches communication network reconfiguration management means. Ishizu, ¶ 16. As shown below in Figure 8, after measuring the communication parameters of a currently selected wireless network, the parameters are "compared and evaluated if the values satisfy the requirement information (2162) or not or are contained in a predetermined threshold value ... if not contained, the measured values are *re-calculated* in the connection policy information creation portion (2101b), and the connection policy information table (2161) is updated." Ex. 1010, ¶ 157; Ex. 1003, ¶ 147.

FIG. 8



Ex. 1010, Fig. 8.

9. Claim 12

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

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 criteria (*user action*) such as “cost” or “power consumption.” *See Id.* ¶ 143, 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, 145–47.

10. Claim 13

Except that claim 13 does not require that the wireless communication interface includes either an ADC or DAC, claim 13 is identical to claims 1 and 4. Accordingly, Claim 13 is anticipated by Katz in view of Ishizu for the same reasons set forth for claim 1 and 4.

11. Claims 14, 16-18

Claims 14 and 16 to 18 are identical to claims 3 and 7 to 9, except that claims 14 and 16 to 18 depend from claim 13 and 3 and 7 to 9 depend from claim 1.

Accordingly, claims 14 and 16 to 18 are anticipated by Katz in view of Ishizu for the same reasons set forth for claims 3 and 7 to 9.

12. Claim 15

Claim 15 is identical to Claim limitation 6, with the only difference being that Claim 15 depends from Claim 13 whereas Claim 5 depends from Claim 4—both of which are anticipated by Tolonen. *See supra* n.1. Accordingly, Tolonen teaches Claim limitation 15[A] for the same reasons. *See supra* Sections VII.A.4, VII.A.13.

13. Claim 19

Claim 19 is a mere alternative combination of Claims 10 and 11. Otherwise the only difference is that claim 19 depends from claim 13, whereas claims 10 and 11 depend from claim 4. Accordingly, claim 19 is anticipated by Katz in view of Ishizu for the same reasons set forth for either claim 10 or claim 11.

14. Claim 20

- (a) *Katz in view of Ishizu discloses “[t]he apparatus of claim 13 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 VII.A. Katz's RFID system can also integrate with a CMOS image sensor to function as a bar code reader. Ex. 1006

4. 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, 4; Ex. 1003, ¶ 153; *see also supra* Section VII.A. 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 VII.B.6-8.

VIII. GROUND 4: Anticipation of Challenged Claims 1–20 by Ishizu

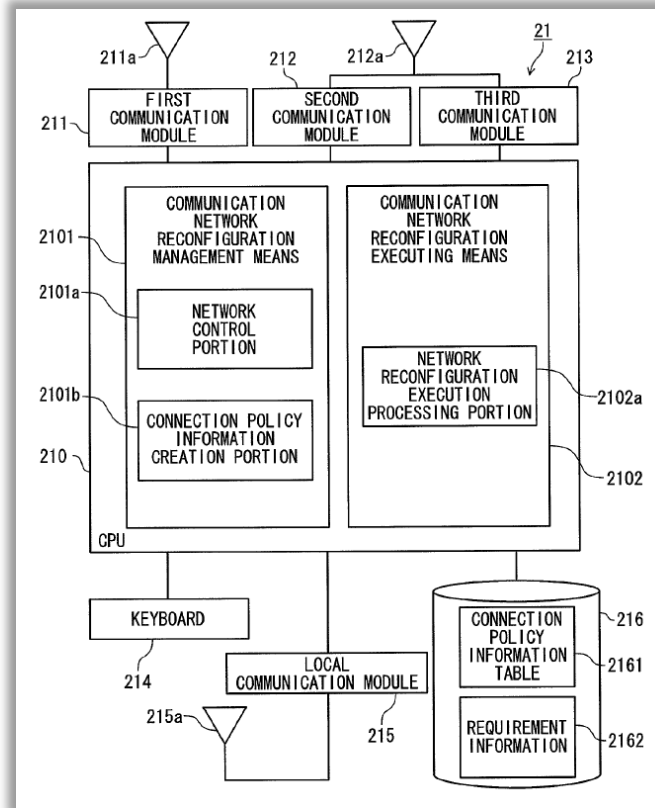
A. Ishizu Invalidates the Claims

1. Claim 1

(a) *I[pre] Ishizu discloses "[a]n apparatus comprising."*

Ishizu discloses a communication terminal capable of dynamic reconfiguration of connection to a plurality of wireless communication networks.

Ex. 1010, ¶ 32. Ishizu’s communication terminal is represented by figure 2, below, which can be in the form of a personal computer, cellular phone, or PDA. *Id.* ¶¶ 57, 68.



Ex. 1010, Fig. 2.

(b) *I[A] Ishizu’s apparatus comprises “a microprocessor.”*

As a personal computer, Ishizu’s communication terminal comprises a microprocessor. Indeed, Ishizu’s “CPU (221) executes and processes a program of execution software (223a) stored in the hard disk or the like by an application execution processing portion (221a).” Ex. 1010, ¶ 69. Ishizu also teaches that the

microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732).

(c) *I[B] Ishizu's apparatus comprises "a wireless communication interface configured to perform at least one of receiving a first radio signal or transmitting a second radio signal, said wireless communication interface electrically coupled to at least one of an analog-to-digital converter (ADC) or a digital-to-analog converter (DAC)."*

Ishizu's communication terminal includes first, second, and third communication modules, each of which are wireless communication interfaces configured to receive and transmit radio signals. For example, Ishizu teaches that the communication modules "can be connected to a plurality of wireless communication networks," and that one of the wireless communication parameters pertains to the "type of radio transmission." Ex. 1010, ¶¶ 99-100. For example, Ishizu's connection methods pertain to WiFi (IEEE 802.11b), WiMAX, etc. Ex. 1010, ¶ 37.

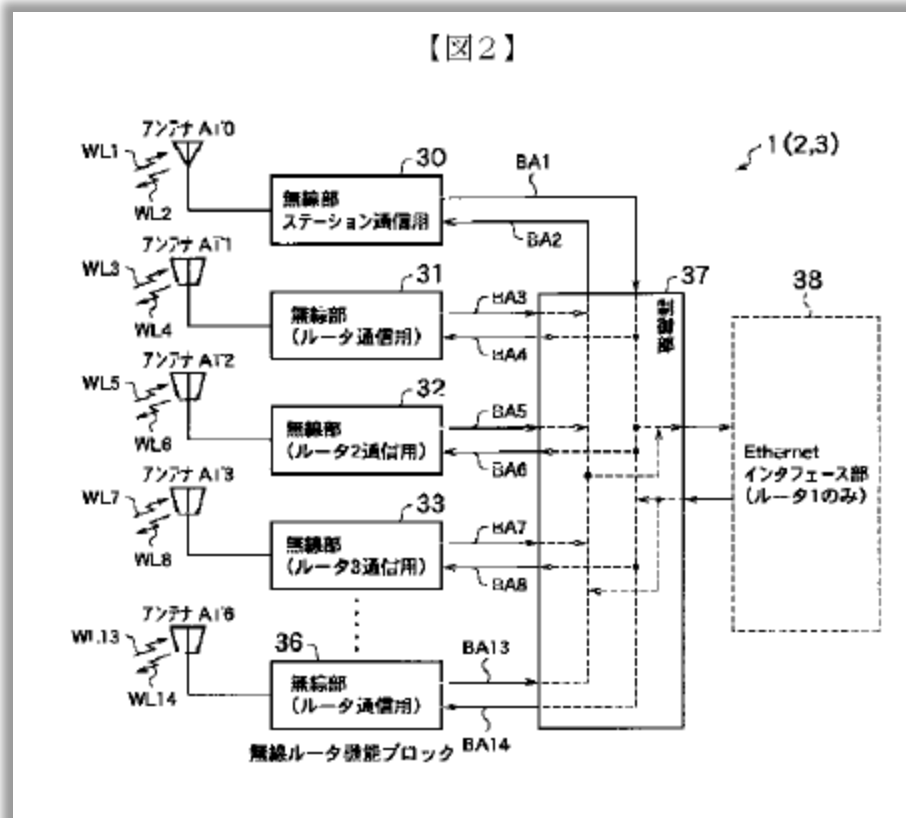
Ishizu's communication modules include at least an AD converter. Ishizu incorporates Japanese Patent Laid-Open No. 2003-152732 and explains that the "wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a

digital signal processor or microprocessor and software.” ¶¶ 16, 27. In other words, Ishizu’s communication modules can be implemented through software radios, including software defined radios. Ex. 1003, ¶¶ 156-59.

(d) *I[C] Ishizu’s “microprocessor is configured to execute at least one of a base-band encoder software program and a base-band decoder software program.”*

Ishizu teaches that the microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732); Ex. 1003, ¶155.

Reviewing the incorporated JP2003152732 (“Hiroshi”) confirms the same. In connection with Figure 2, Hiroshi explains that the wireless units 30 to 36 are connected to antennas, and when “wireless communication is performed from an antenna that has been connected modulation is executed and encoding, encryption, etc. are carried out as needed, and conversely if a wireless signal is received from the antenna demodulation is executed and decoding is carried out as needed.” Ex. 1020, ¶ 37. Hiroshi further teaches that the radio unit executes the processing in the layers below the MAC sublayer and that the control unit performs the basic functions as the routing processing. *Id.* ¶¶ 43-44.



Ex. 1021, Fig. 2; *see also* Ex. 1020, 21 (translating the figure).

As Ishizu relies on Hiroshi to describe SDRs and describes communications, such as 3G, it is clear that Ishizu’s communication terminal operated SDRs, such as those described by Hiroshi. Accordingly, Ishizu disclosed a base-band encoder software program configured to produce a first encoded bit stream by performing at least one of encoding, encryption, and multiplexing.

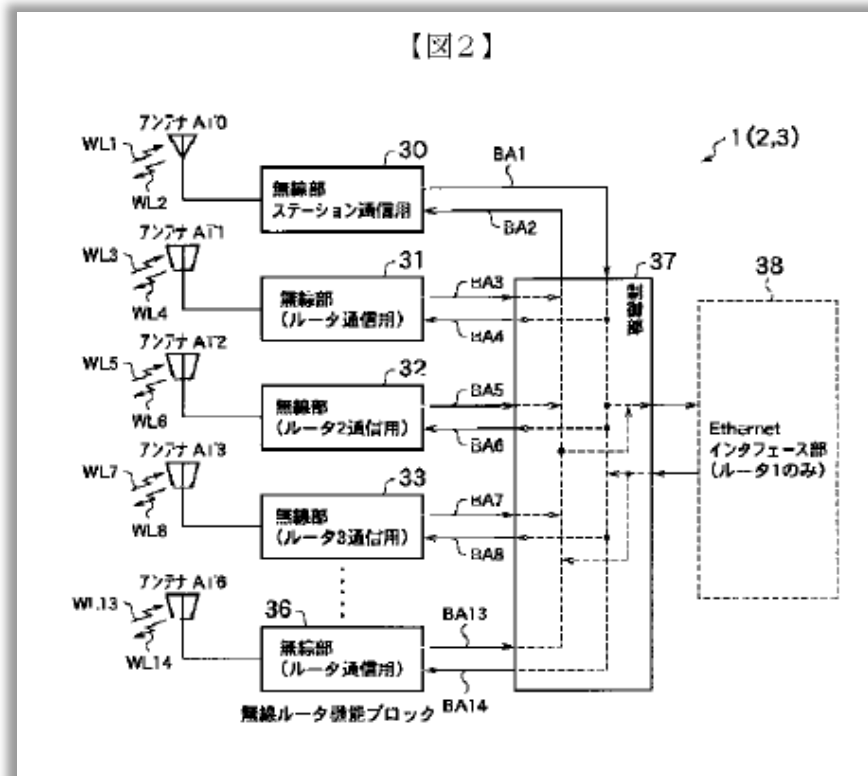
In addition to Ishizu and Hiroshi’s explicit disclosures, however, Ishizu also inherently teaches the baseband encoder/decoder software. Ex. 1003, ¶¶ 163-65 (explaining that “for Ishizu’s SDR to perform modulation of an encoded digital

message at the microprocessor, the message must first pass through a baseband encoder software”).

- (e) *1[D] Ishizu’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.”*

Ishizu teaches that the microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16, 27 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732). Ishizu teaches that a “software wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along- [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a digital signal processor or micro processor and software.” *Id.* ¶ 16. In other words, Ishizu’s communication modules work in connection with a microprocessor, such that the microprocessor performs the encoding of digital information (e.g., modulation and demodulation) and the communication module performs the digital to analog and analog to digital conversions required to communicate via analog radio signals. Ex. 1003, ¶ 166. Indeed, this how Software Defined Radios and Software Radios work. Ex. 1003, ¶ 170 (citing Ex. 1012).

Reviewing the incorporated JP2003152732 (“Hiroshi”) confirms the same. In connection with Figure 2, Hiroshi explains that the wireless units 30 to 36 are connected to antennas, and when “wireless communication is performed from an antenna that has been connected modulation is executed and encoding, encryption, etc. are carried out as needed, and conversely if a wireless signal is received from the antenna demodulation is executed and decoding is carried out as needed.” Ex. 1020, ¶ 37. Hiroshi further teaches that the radio unit executes the processing in the layers below the MAC sublayer and that the control unit performs the basic functions as the routing processing. *Id.* ¶¶ 43-44.



Ex. 1021, Fig. 2; *see also* Ex. 1020, 21 (translating the figure).

As Ishizu relies on Hiroshi to describe SDRs and describes communications, such as 3G, it is clear that Ishizu's communication terminal operated SDRs, such as those described by Hiroshi. Accordingly, Ishizu disclosed a base-band encoder software program configured to produce a first encoded bit stream by performing at least one of encoding, encryption, and multiplexing. Ex. 1003, ¶ 168.

In addition to Ishizu and Hiroshi's explicit disclosures, however, Ishizu also inherently teaches the baseband encoder/decoder software that performs modulation. Ex. 1003, ¶¶ 169 (explaining that "for Ishizu's SDR to perform modulation of an encoded digital message at the microprocessor, the message must first pass through a baseband encoder software"); *see also id.* ¶¶ 170-71.

(f) *1[E] Ishizu's "DAC is configured to output an analog signal corresponding to said first encoded bit stream."*

Ishizu teaches that a "software wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along- [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a digital signal processor or micro processor and software." *Id.* ¶ 16. In other words, Ishizu's communication modules work in connection with a microprocessor, such that the microprocessor performs the encoding of digital information (e.g., modulation and demodulation) and the communication module performs the digital to analog and analog to digital

conversions required to communicate via analog radio signals. Ex. 1003, ¶ 172. Indeed, this how Software Defined Radios and Software Radios work. Ex. 1003, ¶ 174-76 (citing Ex. 1012).

(g) *1[F] Ishizu's "ADC is configured to output a second encoded bit stream corresponding to an analog signal produced by said wireless communication interface."*

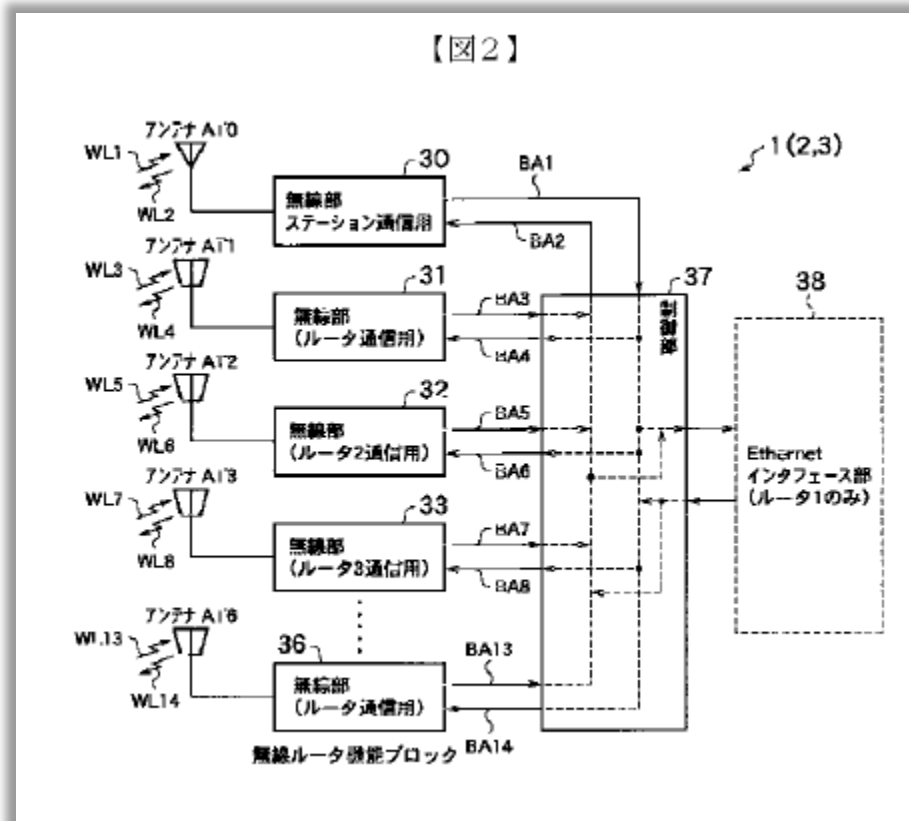
Ishizu teaches that a "software wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along- [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a digital signal processor or micro processor and software." *Id.* ¶ 16. In other words, Ishizu's communication modules work in connection with a microprocessor, such that the microprocessor performs the encoding of digital information (e.g., modulation and demodulation) and the communication module performs the digital to analog and analog to digital conversions required to communicate via analog radio signals. Ex. 1003, ¶ 178. Indeed, this how Software Defined Radios and Software Radios work. Ex. 1003, ¶ 180-83 (citing Ex. 1012).

- (h) 1[G] Ishizu'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."

Ishizu teaches that the microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16, 27 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732). Ishizu teaches that a "software wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along- [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a digital signal processor or micro processor and software." *Id.* ¶ 16. In other words, Ishizu's communication modules work in connection with a microprocessor, such that the microprocessor performs the encoding of digital information (e.g., modulation and demodulation) and the communication module performs the digital to analog and analog to digital conversions required to communicate via analog radio signals. Ex. 1003, ¶ 184. Indeed, this how Software Defined Radios and Software Radios work. Ex. 1003, ¶ 188 (citing Ex. 1012).

Reviewing the incorporated JP2003152732 ("Hiroshi") confirms the same. In connection with Figure 2, Hiroshi explains that the wireless units 30 to 36 are

connected to antennas, and when “wireless communication is performed from an antenna that has been connected modulation is executed and encoding, encryption, etc. are carried out as needed, and conversely if a wireless signal is received from the antenna demodulation is executed and decoding is carried out as needed.” Ex. 1020, ¶ 37. Hiroshi further teaches that the radio unit executes the processing in the layers below the MAC sublayer and that the control unit performs the basic functions as the routing processing. *Id.* ¶¶ 43-44.



Ex. 1021, Fig. 2; *See also* Ex. 1020, 21 (translating the figure).

As Ishizu relies on Hiroshi to describe SDRs and describes communications, such as 3G, it is clear that Ishizu's communication terminal operated SDRs, such as those described by Hiroshi. Accordingly, Ishizu disclosed a base-band encoder software program configured to produce a first encoded bit stream by performing at least one of encoding, encryption, and multiplexing. Ex. 1003, ¶ 186.

In addition to Ishizu and Hiroshi's explicit disclosures, however, Ishizu also inherently teaches the baseband encoder/decoder software that performs modulation/demodulation. Ex. 1003, ¶¶ 187 (explaining that "for Ishizu's SDR to perform modulation of an encoded digital message at the microprocessor, the message must first pass through a baseband encoder software"); *see also id.* ¶¶ 188-89.

2. Claim 2

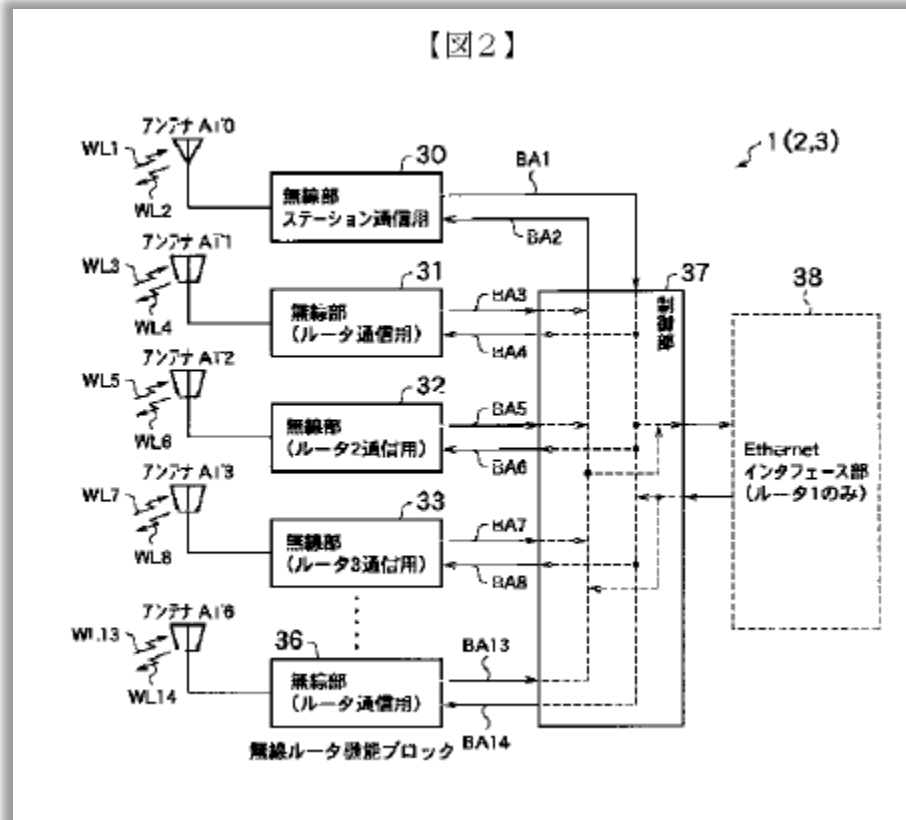
- (a) *Ishizu's "apparatus is devoid of dedicated hardware components configured to implement at least one of the following functions: source encoding of said first bit stream, encryption, channel encoding, multiplexing, modulation, frequency spreading, media access control, frequency de-spreading, de-modulation, de-multiplexing, channel decoding, decryption, or source decoding."*

Ishizu teaches that the microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16, 27 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732).

Ishizu teaches that a “software wireless communication device can handle a plurality of frequencies or wireless methods by switching software since a received radio wave is along- [analog]-digital converted by an AD converter once, and demodulation or the like is performed by a digital signal processor or micro processor *and software*.” *Id.* ¶ 16 (emphasis added). In other words, Ishizu’s communication modules work in connection with a microprocessor, such that the microprocessor runs dedicated software, in lieu of hardware, that performs the encoding of digital information (e.g., modulation and demodulation), and the communication module performs the digital to analog and analog to digital conversions required to communicate via analog radio signals. Ex. 1003, ¶ 190. Indeed, this how Software Defined Radios and Software Radios work. Ex. 1003, ¶ 194 (citing Ex. 1012).

Reviewing the incorporated JP2003152732 (“Hiroshi”) confirms the same. In connection with Figure 2, Hiroshi explains that the wireless units 30 to 36 are connected to antennas, and when “wireless communication is performed from an antenna that has been connected modulation is executed and encoding, encryption, etc. are carried out as needed, and conversely if a wireless signal is received from the antenna demodulation is executed and decoding is carried out as needed.” Ex. 1020, ¶ 37. Hiroshi further teaches that the radio unit executes the processing in the

layers below the MAC sublayer and that the control unit performs the basic functions as the routing processing. *Id.* ¶¶ 43-44.



Ex. 1021, Fig. 2; See also Ex. 1020, 21 (translating the figure).

As Ishizu relies on Hiroshi to describe SDRs and describes communications, such as 3G, it is clear that Ishizu's communication terminal operated SDRs, such as those described by Hiroshi. Accordingly, Ishizu disclosed a base-band encoder software program configured to produce a first encoded bit stream by performing at least one of encoding, encryption, and multiplexing. Ex. 1003, ¶ 192.

In addition to Ishizu and Hiroshi's explicit disclosures, however, Ishizu also inherently teaches the baseband encoder/decoder software that performs modulation/demodulation. Ex. 1003, ¶¶ 193 (explaining that "for Ishizu's SDR to perform modulation of an encoded digital message at the microprocessor, the message must first pass through a baseband encoder software"); *see also id.* ¶ 194.

3. Claim 3

- (a) *Ishizu's "base-band encoder software program and ... base-band decoder software program are implemented as a single software program."*

Ishizu teaches that the microprocessor performs digital signal processing including demodulation of a received analog-digital converted signal. Ex. 1010, ¶¶ 16, 27 (incorporating by reference Japanese Patent Laid-Open No. 2003-152732); *see supra* Section VIII.A.2. A POSITA would recognize that software modules may either be standalone or implemented as part of a single software program. Ex. 1003, ¶ 197. A POSITA would further understand that either implementation would constitute an obvious choice that would result in essentially the same predictable solution. *Id.*

4. Claims 4-12, 14-20

As the mappings of claims 4-12 and 14-20 of ground 3 are exclusively to Ishizu's teachings, claims 4 to 20 are anticipated for the same reasons set forth for Ground 3. *See supra* Section VII.A.1-9, VII.A.11-14.

5. Claim 13

Except that claim 13 does not require that the wireless communication interface includes either an ADC or DAC, claim 13 is identical to claims 1 and 4. Accordingly, Claim 13 is anticipated by Ishizu for the same reasons set forth for claim 1 and 4.

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 '654 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 '654 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 13,068 words according to the word-processing program used to prepare this document (Microsoft Word).

Dated: January 12, 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 12, 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 '654 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