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(54) HANDOVER IN A WIRELESS LOCAL AREA NETWORK (WLAN)

WEITERREICHUNG IN EINEM DRAHTLOSEN LOKALEN NETZWERK (WLAN)

TRANSFERT DANS UN RESEAU LOCAL SANS FIL (WLAN)

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Description

FIELD OF INVENTION

[0001] The present invention relates wireless communication systems. In particular, the invention relates to handover in such systems.

BACKGROUND

[0002] Figure 1 is a simplified illustration of a wireless transmit/receive unit (WTRU) 14_{1N} potentially handing over between two basic service sets (BSSs), BSS_1 12_1 and BSS_2 12_2, in a wireless local area network (WLAN). Originally, BSS_1 12_1 has an access point (AP) 10_1 and a plurality of WTRUs 14_{11} to 14_{1N} and BSS_2 12_2 has an access point (AP) 10_2 and a plurality of WTRUs 14_{21} to 14_{23}. The WTRU 14_{1N} is in wireless communication with AP 10_1. As illustrated in Figure 1, both APs 10_2, 10_1 are connected to a distribution system 16. To decide whether to handover between BSSs 12, such as BSS_1 12_1 and BSS_2 12_2, the WTRU 14_{1N} measures the received signal strength (RSS) or signal to noise ratio (SNR) for each BSS 12_1, 12_2. The BSS 12 having the better RSS or SNR is selected for further communication. If BSS_1 12_1 is selected, the current communication links are maintained, as illustrated as a solid line. If BSS_2 12_2 is selected, a new link is established with BSS_2, as illustrated as a dashed line.

[0003] Although this approach most likely provides the WTRU 14_{1N} with the strongest link, other criteria may make such a connection undesirable. To illustrate, the BSS having the strongest link may be overloaded and can not meet some quality of service (QoS) requirements of the WTRU 14_{1N}. Accordingly, it is desirable to have alternate handover schemes.

[0004] US 2003/0069018 discloses a method for providing a triggering mechanism in an all-IP wireless communication system. A plurality of communication paths are established between a mobile terminal and a correspondent node to obtain at least one QoS parameter associated with each communication path. Each communication path that provides a predetermined acceptable level of performance is then identified. A handoff trigger is then generated to the communication path that provides the highest level of performance to the mobile terminal.

[0005] US 2003/0142651 discloses a method for estimating QoS for making a handoff trigger decision for a remote terminal in a wireless IP network. At least a first and second probing packet is generated with an access router from a plurality of access points. The first and second probing packets are then sent from the access routers over a fixed core network having a plurality of routers to a correspondent access router and then back to the access routers. At least one collector packet is also generated and sent to follow the first and second probing packets to gather at least one predetermined QoS parameter from the routers after the first and second probing packets have left the routers. The QoS parameters are then processed with the access routers to make the handoff trigger decision.

[0006] EP-A-1206069 discloses a method of providing QoS involving wireless transmissions of real-time signals over a WLAN link. Varied services are transmitted from an access point to varied receiving devices of the WLAN, and a threshold of QoS is set for each individual service. Links below this threshold are identified as degraded links, and the quality of other channels in the system are measured to determine qualified transmission channels. Automatic link recovery procedures are initiated to switch transmission to a new transmission channel, to recover a desired quality link, in response to the measuring step and the identification step.

SUMMARY

[0007] In triggering a handoff by a wireless transmit/receive unit (WTRU) from a current basic service set (BSS) in a wireless local area network (WLAN), the following are performed. A highest class of traffic service and quality of service (QoS) is determined for the highest class from a basic service set (BSS) beacon. Handoff is terminated and communication is retained with a current BSS when the signal to noise ratio (SNR) or received signal strength (RSS) is greater than a high threshold of the highest class. Other criteria is evaluated to determine whether a handoff is desired when the SNR or RSS is less than the high threshold.

BRIEF DESCRIPTION OF THE DRAWING(S)

[0008] The present invention will be understood from consideration of the accompanying figures, wherein like elements are designated by like numerals, and wherein:

[0009] Figure 1 is an illustration of a WTRU in potential handover.

[0010] Figure 2 is a flow chart of an embodiment of a RSS/SNR and other system statistic handover algorithm.

[0011] Figure 3 is a simplified diagram of an embodiment of a WTRU capable of RSS/SNR and other system statistic handover.

[0012] Figure 4 is a flow chart of a RSS/SNR and other system statistic handover algorithm embodiment.

[0013] Figure 5 is a flow chart of an embodiment of an algorithm for calculation of a QoS index, which may be employed by Figure 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT(S)

[0014] Although the features and elements of the present invention are described in the preferred embodiments in particular combinations, each feature or element can be used alone (without the other features and elements of the preferred embodiments) or in various combinations with or without other features and elements of the present invention.

[0015] Hereafter, a wireless transmit/receive unit (WTRU) includes but is not limited to a user equipment, station, mobile station, fixed or mobile subscriber unit, pager, or any other type of device capable of operating in a wireless environment. When referred to hereafter, an access point includes but is not limited to a base station, Node-B, site controller, or any other type of interfacing device in a wireless environment. Although the following is discussed with respect to WLANs, the invention can be applied to other wireless networks.

[0016] Figure 2 is an embodiment of a RSS/SNR and other system statistic handover. A WTRU, such as WTRU 14_{1N} of Figure 1, initiates the handover algorithm to determine whether handing over between BSSs 12 is desirable, such as from BSS_1 12_1 to BSS_2 12_2, step 530. The RSS and/or SNR is measured for each BSS 12, including the current BSS and any potential handover BSSs, step S32. Other system statistics are measured for each BSS 12, step S34. The other system statistics may relate to the quality of service, such as delay bounds, bandwidth requirements (i.e. data rate), and frame error rate. Based on the RSS/SNR and other system statistics, a handover decision is made, step S36. Typically, the other system statistics are based on the traffic class of the WTRU's services.

[0017] Figure 3 is an embodiment of a WTRU 18 capable of such a handover. The components of Figure 3 may be implemented on a single integrated circuit (IC), such as an application specific integrated circuit (ASIC), on multiple ICs, by discrete components or a combination of IC(s) and discrete component(s). Wireless signals are received and transmitted over an antenna 20 or antenna array and a transceiver (Xceiver) 22 of the WTRU 18. A RSS/SNR measuring device 24 measures the RSS and/or SNR of each BSS 12. A handover controller 26 receives the RSS/SNR measurements and other system statistics and determines whether a handover to another BSS 12 is desired. The other system statistics may be recovered from received communications, as shown in Figure 3 or by other means.

[0018] Figure 4 is an illustration of a preferred embodiment for RSS/SNR and other system statistic handover. For each traffic channel, QoS characters are defined, such as delay bounds, bandwidth requirements (data rate), and frame error rate. Minimum and maximum values for each parameter are defined for each traffic class. A minimum and maximum value of SNR is also defined for each traffic class. Table 1 illustrates an example of QoS characteristics and SNR values for different traffic classes.

Table 1 QoS Characteristics and SNR, definition for different traffic classes

	Delay (D)		Data Rate (BW)		Frame Error Rate (FER)		SNR,	
Traffic Class_1	Dmin	Dmax	BWmin	BWmax	FERmin	FERmax	SNRmin	SNRmax
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----	--	--						---
Traffic Class_n	Dmin	Dmax	BWmin	BWmax	FERmin	FERmax	SNRmin	SNRmax

[0019] The handover algorithm is triggered when the SNR value drops below a high SNR threshold, i.e., SNR max, for the given traffic class (TC) associated with the entity seeking a handover, step S40. The TC may be one of those shown in Table 1. The algorithm compares the SNR value with a low SNR threshold and depending on the result acts, generally, as follows.

[0020] If the SNR value is between the low and high SNR thresholds, the algorithm checks the QoS index for this traffic class. The QoS index may be derived from any or all the criteria in Table 1 or, alternately, other criteria may be used. If the QoS index is below the QoS index threshold, the WTRU starts scanning neighboring cells to trigger a handover. If the SNR value is higher than the high SNR threshold, the algorithm terminates since link quality is good and there is no need for handover. For SNR values below the low threshold, the WTRU starts scanning neighboring BSSs without comparing the QoS index with the QoS index threshold. Although the above refers to SNR, RSS or a combination of RSS and SNR may be used instead.

[0021] Referring to Figure 4, the highest class of service for traffic at the monitoring WTRU 18 and the QoS requirements of the WTRU 18 are examined, step S42. If the SNR is at or above the low threshold, step S44, the channel utilization and the frame loss rate from the QBSS load element is determined, step S48. The QoS parameter set element is checked,

step S50, and the QoS index is calculated, step S52. If the QoS index is greater than a QoS index threshold, the handover algorithm is ended, steps S54, S86. If the Cos index is less than or equal to the threshold, the algorithm proceeds to determining a list of neighboring BSSs 12 to scan as described subsequently, for steps S62 to S84.

[0022] If the SNR is below the low threshold, step S44, the channel utilization is determined and frame loss rate derived from the QBSS load element, step S56. The QoS parameter set element is checked, step S58, and the QoS index is calculated, step 60.

[0023] A list of neighbor BSSs 12 is determined, step S62, and a scan neighbor routine is initiated, step S64. The first BSS 12 of the list is scanned, step S66. The probe response is obtained from the first BSS 12 and the frame loss rate, channel utilization and QoS parameters are obtained from the probe response, step S68. The SNR and QoS parameter elements are checked, step S70. A QoS index calculation for the first BSS 12 of the neighbors to be scanned is performed, step S72.

[0024] In the event that there are more BSSs 12 in the list, step S74, the next BSS 12 is picked, step S76. Steps S68 through S74 are repeated for the next BSS 12.

[0025] When there are no more BSSs 12 to be scanned, the BSS 12 with the highest QoS index is picked, at step S78. A difference is taken between the QoS index of the selected BSS 12 and the QoS index of the current BSS 12. To keep the WTRU 18 from frequently handing over between BSSs 12, the QoS index difference value is compared with a hysteresis to determine if it is bigger than the hysteresis, step S80. The hysteresis is preferably a function of the traffic class (TC), although it may be derived by other techniques. If the calculated difference is greater than the last stored hysteresis, the handover to the new cell is initiated and the hysteresis value is reset to its original value, step S82. The handoff algorithm terminates, step S86. If the difference between the current and target cell QoS indexes is smaller than the hysteresis, the hysteresis value is updated, step S84. Preferably, the hysteresis value is decreased in order to enable the WTRU 18 utilizing the handover algorithm to have a better chance to obtain a handover to a new cell in the event that the WTRU 18 continues to experience poor service.

[0026] An embodiment of a QoS index calculation algorithm is shown in Figure 5. Although the algorithm can be used in other applications, it is preferably used with steps S52 and S72 of Figure 4. The QoS index is initially set to zero, steps S88, S90, and a list of available QoS parameters is created, step S92. The first QoS parameter in the list is selected, step S94. The selected QoS parameter is compared with the high threshold taken from the associated traffic class (TC), step S96. If the selected parameter is greater than the high threshold, the QoS index is incremented, step S98. Alternatively, if the QoS parameter is less than the high threshold and not less than the low threshold, step S100, the QoS index remains unchanged, If the QoS parameter is less than both the high and low threshold, the present QoS index is decreased by n+1, where n is the total number of BSSs being examined, step S102. After one of these three (3) steps, S98, S100, S102 has been performed, it is determined if there are any more QoS parameters to be examines, step S104. In the event that there are more QoS parameters, the next QoS parameter is selected, step S106. Steps S96 to S104 are repeated until all of the QoS parameters have been examined. After all of the QoS parameters have been evaluated, the QoS index is produced, step S108.

[0027] Although Figure 5 is one embodiment for producing a QoS index, others may be used. For example, the QoS index may be produced by weighting QoS parameters.

[0028] One application of the algorithms in Figures 4 and 5 can be with an 802.11e compliant AP and WTRU. Additionally, another application is with an 802.11b AP and WTRU with the needed parameters for the algorithm added to the 802.11 beacon and probe response frames or through proprietary signaling. These algorithms can be also applied to other wireless environments.

Claims

1. A method for determining handoff by a wireless transmit/receive unit, WTRU, from a current basic service set, BSS, in a wireless local area network, WLAN, comprising:

   determining (S42) a highest class of traffic service, and a quality of service, QoS, requirement for said highest class from a BSS beacon, said class of traffic service being associated with a high threshold for received signal strength and/or signal to noise ratio, RSS/SNR_{max}, and a low threshold for received signal strength and/or signal to noise ratio, RSS/SNR_{min};
   comparing a current received signal strength and/or signal to noise ratio, RSS/SNR, with RSS/SNR_{max}, and terminating the handoff if the current RSS/SNR is above RSS/SNR_{max};
   if the current RSS/SNR is not above RSS/SNR_{max}, then comparing the current RSS/SNR with RSS/SNR_{min}, and performing the following steps if current RSS/SNR is equal to or above RSS/SNR_{min}:

      obtaining (S56) channel utilization and frame loss rate from a QBSS load element provided in the beacon;

obtaining (S58) the QoS parameter set and average delay in a current BSS contained in the beacon;
calculating (S60) a QoS index employing a list of QoS parameters including one or more of the channel utilization, the frame loss rate and the average delay of the current BSS, and wherein the step of calculating the QoS index further comprises

setting (S90) a QoS index to zero (0);
creating (S92) a list of QoS parameters;
selecting (S94) one of the QoS parameters;
comparing (S96, S100) the selected QoS parameter with a high QoS threshold and a low QoS threshold for that QoS parameter; and
incrementing (S98) the QoS index when the selected QoS parameter is greater than the high QoS threshold for that QoS parameter;
reducing (S102) the QoS index when the selected QoS parameter is less than the low QoS threshold for that QoS parameter; and
leaving the QoS index unchanged when the selected QoS parameter is not greater that the high QoS threshold and not less than the low QoS threshold for that QoS parameter; and

terminating handoff and retaining communication with the current BSS when the calculated QoS index is at least equal to a QoS index threshold corresponding to the QoS requirement.

2. The method of claim 1 further comprising:

continuing (S54) a handoff operation when the calculated QoS index is less than the QoS index threshold of the current BSS.

3. The method of claim 2, wherein the continuing handoff operation comprises:

obtaining (S62) a list of neighboring BSS's;
calculating (S72) a QoS index for each BSS from the list;
selecting (S78) the neighboring BSS having the highest QoS index;
comparing the QoS index for the selected neighboring BSS with the QoS index for the current BSS;
initiating (S82) handoff to the selected neighboring BSS when the QoS index of the selected neighboring BSS is more than a hysteresis value higher than the QoS index of the current BSS.

4. The method of claim 3, further comprising, if handoff was not initiated,lowering (S84) the hysteresis value in order to enable the WTRU to have a better chance to obtain a handover in the event that the WTRU continues to experience poor service.

5. A wireless transmit/receive unit, WTRU, (18), comprising:

an RSS/SNR, measuring device (24), for measuring the received signal strength RSS and/or the signal to noise ratio SNR of basic service sets, BSS's; and
a handover controller (26) for receiving the RSS/SNR measurements and for performing the method as defined in any one of claims 1-4 in response to said RSS/SNR measurements.

Patentansprüche

1. Verfahren zum Bestimmen der Weiterreichung durch eine drahtlose Sende/Empfangseinheit WTRU von einem aktuellen Grunddienstsatz BSS in einem drahtlosen lokalen Netzwerk WLAN, das aufweist:

Bestimmen (S42) einer höchsten Verkehrsdienstklasse und einer Dienstqualität-, QoS-, Anforderung für diese höchste Klasse aus einem BSS-Beacon, wobei diese Verkehrsdienstklasse mit einem oberen Schwellwert für die Empfangssignalstärke und/oder das Signal-Rauschverhältnis RSS/SNR_{max} und einem unteren Schwellwert für die Empfangssignalstärke und/oder das Signal-Rauschverhältnis RSS/SNR_{min} verbunden ist;
Vergleichen einer aktuellen Empfangssignalstärke und/oder eines Signal-Rauschverhältnis RSS/SNR mit RSS/SNR_{max} und Abbrechen der Weiterreichung, wenn das aktuelle RSS/SNR über RSS/SNR_{max} ist;
wenn das aktuelle RSS/SNR nicht über RSS/SNR_{max} ist, Vergleichen des aktuellen RSS/SNR mit RSS/SNR_{min}

und Durchführen der folgenden Schritte, wenn das aktuelle RSS/SNR gleich oder über RSS/SNR_{min} ist:

Beschaffen (S56) der Kanalausnutzung und der Rahmenverlustrate aus einem QBSS-Lastelement, das in dem Beacon bereitgestellt wird;
Beschaffen (S58) des QoS-Parametersatzes und der mittleren Verzögerung in einem aktuellen BSS, die in dem Beacon enthalten sind;
Berechnen (S60) eines QoS-Indexes unter Verwendung einer Liste mit QoS-Parametern, welche die Kanalausnutzung und/oder die Rahmenverlustrate und/oder die mittlere Verzögerung des aktuellen BSS umfassen, und wobei der Schritt der Berechnung des QoS-Indexes ferner aufweist:

Setzen (S90) eines QoS-Indexes auf null (0);
Erzeugen (S92) einer Liste mit QoS-Parametern;
Auswählen (S94) eines der QoS-Parameter;
Vergleichen (S96, S100) des ausgewählten QoS-Parameters mit einem oberen QoS-Schwellwert und einem unteren QoS-Schwellwert für diesen QoS-Parameter; und
Inkrementieren (S98) des QoS-Indexes, wenn der ausgewählte QoS-Parameter größer als der obere QoS-Schwellwert für diesen QoS-Parameter ist;
Verringern (S102) des QoS-Indexes, wenn der ausgewählte QoS-Parameter niedriger als der untere QoS-Schwellwert für diesen QoS-Parameter ist; und
Unverändertlassen des QoS-Indexes, wenn der ausgewählte QoS-Parameter nicht größer als der obere QoS-Schwellwert und nicht niedriger als der untere QoS-Schwellwert für diesen QoS-Parameter ist; und

Abbrechen der Weiterreichung und Beibehalten der Kommunikation mit dem aktuellen BSS, wenn der berechnete QoS-Index zumindest gleich einem QoS-Indexschwellwert ist, welcher der QoS-Anforderung entspricht.

2. Verfahren nach Anspruch 1, das ferner aufweist:

Fortsetzten (S54) eines Weiterreichungsbetriebs, wenn der berechnete QoS-Index niedriger als der QoS-Indexschwellwert des aktuellen BSS ist.

3. Verfahren nach Anspruch 2, wobei das Fortsetzen des Weiterreichungsbetriebs aufweist:

Beschaffen (S62) einer Liste benachbarter BSSen;
Berechnen (S72) eines QoS-Indexes für jeden BSS aus der Liste;
Auswählen (S78) des benachbarten BSS mit dem höchsten QoS-Index;
Vergleichen des QoS-Index für den ausgewählten benachbarten BSS mit dem QoS-Index für den aktuellen BSS;
Einleiten (S82) der Weiterreichung zu dem ausgewählten benachbarten BSS, wenn der QoS-Index des ausgewählten benachbarten BSS um mehr als einen Hysteresewert höher als der QoS-Index des aktuellen BSS ist.

4. Verfahren nach Anspruch 3, das ferner, wenn die Weiterreichung nicht eingeleitet wurde, das Senken (S84) des Hysteresewerts aufweist, um zu ermöglichen, daß die WTRU in dem Fall, daß die WTRU weiter einen schlechten Dienst wahrnimmt, eine bessere Aussicht hat, eine Weiterreichung zu erreichen.

5. Drahtlose Sende/Empfangseinheit WTRU (18), die aufweist:

eine RSS/SNR-Meßvorrichtung (24) zum Messen der Empfangssignalstärke RSS und/oder des Signal-Rausch-verhältnisses SNR von Grunddienstsätzen BSSen; und
eine Weiterreichungssteuerung (26) zum Empfangen der RSS/SNR-Messungen und zum Durchführen des Verfahrens, wie in jedem der Ansprüche 1 bis 4 definiert, ansprechend auf diese RSS/SNR-Messungen.

Revendications

1. Procédé de détermination de transfert par une unité émettrice/réceptrice sans fil, WTRU, à partir d'un ensemble actuel de services de base, BSS, dans un réseau local sans fil, WLAN, comprenant :

la détermination (S42) d'une classe supérieure de service de trafic et d'une condition de qualité des services,

QoS, pour ladite classe supérieure à partir d'une balise BSS, ladite classe de service de trafic étant associée à un seuil haut pour l'intensité de signal reçu et/ou le rapport signal/bruit, RSS/SNR_{max}, et à un seuil bas pour l'intensité de signal reçu et/ou le rapport signal/bruit, RSS/SNR_{min} ;
la comparaison d'une intensité de signal reçu et/ou d'un rapport signal/bruit actuel, RSS/SNR, avec RSS/SNR_{max}, et l'arrêt du transfert si le RSS/SNR actuel est supérieur à RSS/SNR_{max} ;
si le RSS/SNR actuel n'est pas supérieur à RSS/SNR_{max}, alors la comparaison du RSS/SNR actuel avec RSS/SNR_{min}, et l'exécution des étapes suivantes si le RSS/SNR actuel est égal ou supérieur à RSS/SNR_{min} :

l'obtention (S56) de l'utilisation de canal et du taux de perte de trames à partir d'un élément de charge QBSS prédisposé dans la balise ;
l'obtention (S58) l'ensemble de paramètres QoS et le retard moyen dans un BSS actuel contenu dans la balise ;
le calcul (S60) d'un indice QoS en utilisant une liste de paramètres QoS comprenant un ou plusieurs parmi l'utilisation de canal, le taux de perte de trames et le retard moyen du BSS actuel, et dans lequel l'étape de calcul de l'indice QoS consiste en outre à :

fixer (S90) un indice QoS à zéro (0) ;
créer (S92) une liste de paramètres QoS ;
sélectionner (S94) un des paramètres QoS ;
comparer (S96, S100) le paramètre QoS sélectionné avec un seuil QoS haut et un seuil QoS bas pour ce paramètre QoS ; et
incrémenter (S98) l'indice QoS quand le paramètre QoS sélectionné est supérieur au seuil QoS haut pour ce paramètre QoS ;
réduire (S102) l'indice QoS quand le paramètre QoS sélectionné est inférieur au seuil QoS bas pour ce paramètre QoS ; et
laisser l'indice QoS inchangé quand le paramètre QoS sélectionné n'est pas supérieur au seuil QoS haut et
n'est pas inférieur au seuil QoS bas pour ce paramètre QoS ; et
l'arrêt du transfert et le maintien de la communication avec le BSS actuel quand l'indice QoS calculé est au moins égal à un seuil d'indice QoS correspondant à la condition de QoS.

2. Procédé selon la revendication 1, comprenant en outre :

la poursuite (S54) d'une opération de transfert quand l'indice QoS calculé est inférieur au seuil d'indice QoS du BSS actuel.

3. Procédé selon la revendication 2, dans lequel la poursuite de l'opération de transfert comprend :

l'obtention (S62) d'une liste de BSS voisins ;
le calcul (S72) d'un indice QoS pour chaque BSS dans la liste ;
la sélection (S78) du BSS voisin ayant le plus haut indice QoS ;
la comparaison de l'indice QoS pour le BSS voisin sélectionné avec l'indice QoS pour le BSS actuel ;
le lancement (S82) du transfert vers le BSS voisin sélectionné quand l'indice QoS du BSS voisin sélectionné est supérieur de plus d'une valeur d'hystérésis à l'indice QoS du BSS actuel.

4. Procédé selon la revendication 3, comprenant en outre, si le transfert n'a pas été lancé, la diminution (S84) de la valeur d'hystérésis de manière à permettre à la WTRU d'avoir une meilleure chance d'obtenir un transfert dans le cas où la WTRU continue de subir un service insuffisant.

5. Unité émettrice/réceptrice sans fil, WTRU, (18) comprenant :

un dispositif de mesure de RSS/SNR (24), pour mesurer l'intensité de signal reçu RSS et/ou le rapport signal/bruit SNR d'ensembles de services de base, BSS ; et
un contrôleur de transfert (26) pour recevoir les mesures de RSS/SNR et pour effectuer le procédé selon l'une quelconque des revendications 1-4 en réponse auxdites mesures de RSS/SNR.

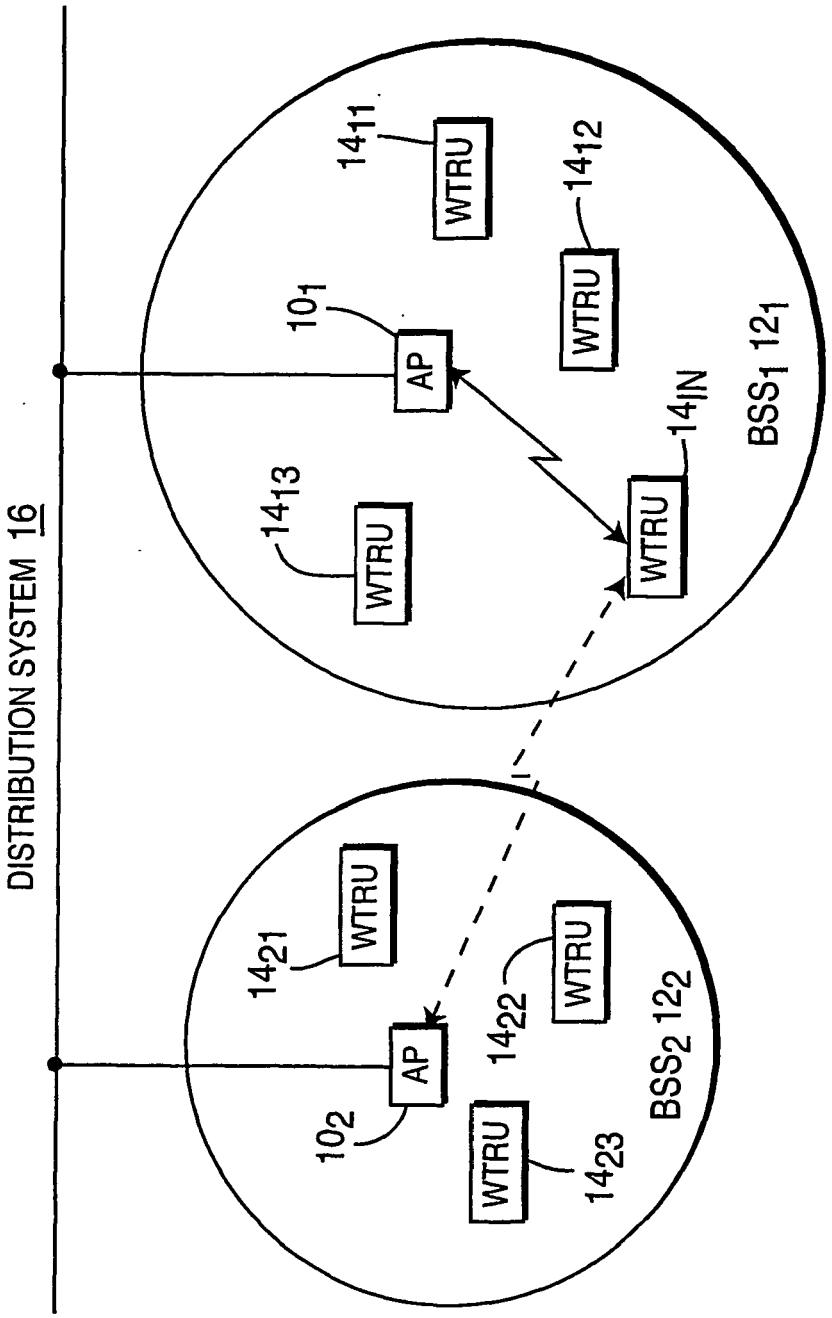
DISTRIBUTION SYSTEM 16
AP
10_1
AP
10_2
WTRU
14_{11}
WTRU
14_{12}
WTRU
14_{13}
WTRU
14_{1N}
WTRU
14_{21}
WTRU
14_{22}
WTRU
14_{23}
BSS_1 12_1
BSS_2 12_2

FIG. 1

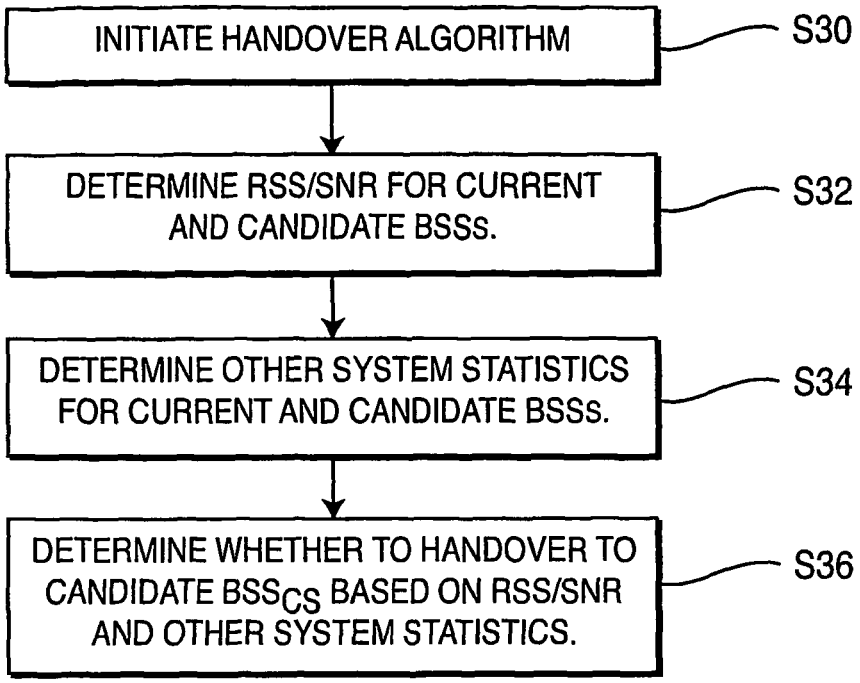
INITIATE HANDOVER ALGORITHM
S30
DETERMINE RSS/SNR FOR CURRENT AND CANDIDATE BSSs.
S32
DETERMINE OTHER SYSTEM STATISTICS FOR CURRENT AND CANDIDATE BSSs.
S34
DETERMINE WHETHER TO HANDOVER TO CANDIDATE BSS$_{CS}$ BASED ON RSS/SNR AND OTHER SYSTEM STATISTICS.
S36

FIG. 2

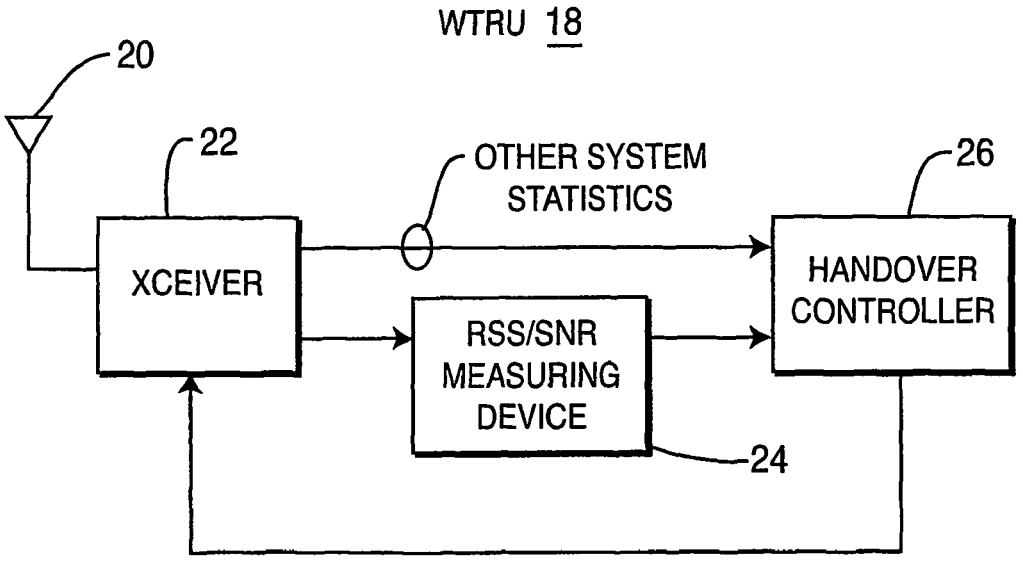
WTRU 18
20
22
OTHER SYSTEM STATISTICS
26
XCEIVER
HANDOVER CONTROLLER
RSS/SNR MEASURING DEVICE
24

FIG. 3

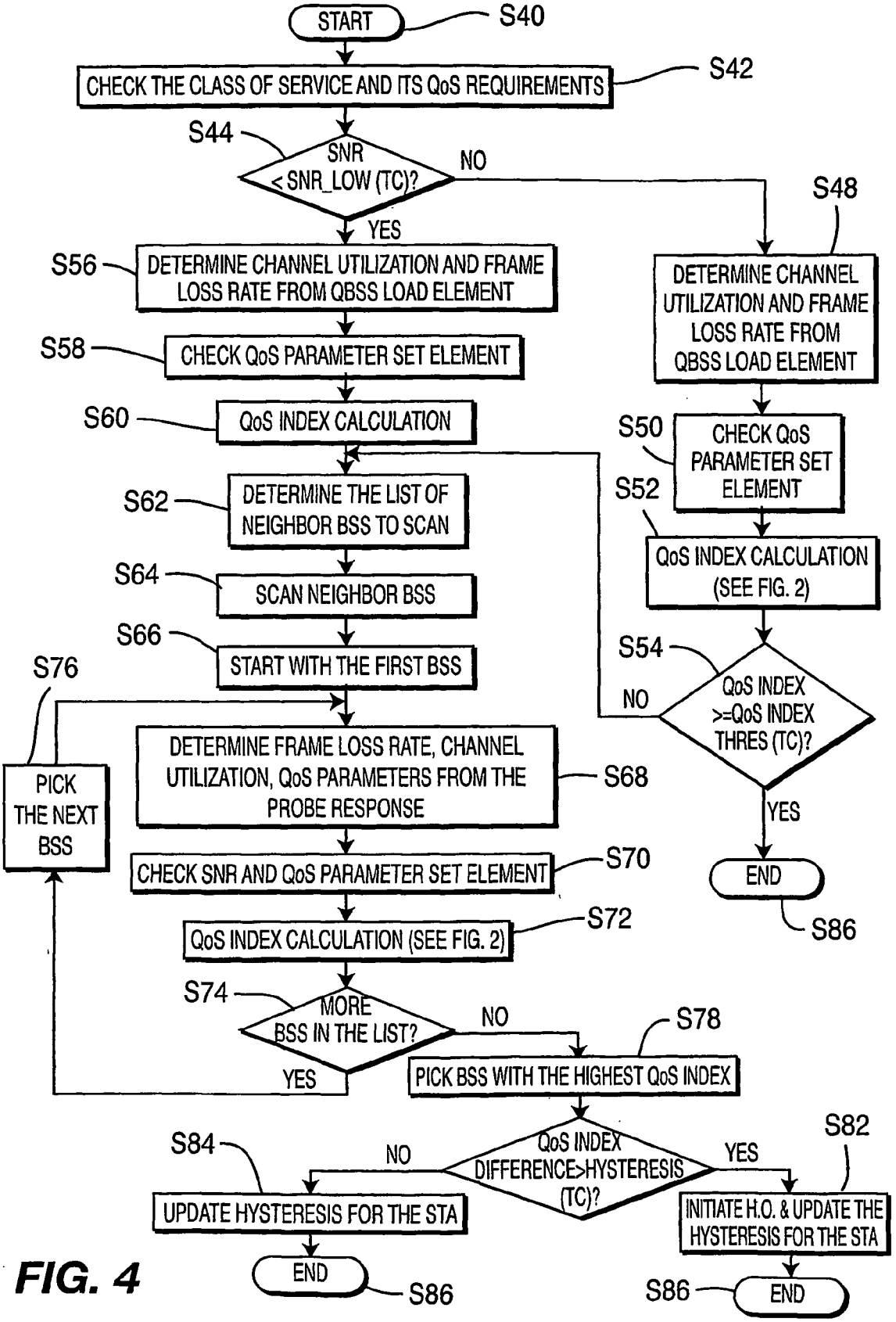
START
S40
CHECK THE CLASS OF SERVICE AND ITS QoS REQUIREMENTS
S42
S44
SNR < SNR_LOW (TC)?
NO
YES
S48
DETERMINE CHANNEL UTILIZATION AND FRAME LOSS RATE FROM QBSS LOAD ELEMENT
S56
DETERMINE CHANNEL UTILIZATION AND FRAME LOSS RATE FROM QBSS LOAD ELEMENT
S58
CHECK QoS PARAMETER SET ELEMENT
S60
QoS INDEX CALCULATION
S50
CHECK QoS PARAMETER SET ELEMENT
S52
QoS INDEX CALCULATION (SEE FIG. 2)
S62
DETERMINE THE LIST OF NEIGHBOR BSS TO SCAN
S64
SCAN NEIGHBOR BSS
S66
START WITH THE FIRST BSS
S54
QoS INDEX >=QoS INDEX THRES (TC)?
NO
YES
END
S86
S76
PICK THE NEXT BSS
DETERMINE FRAME LOSS RATE, CHANNEL UTILIZATION, QoS PARAMETERS FROM THE PROBE RESPONSE
S68
CHECK SNR AND QoS PARAMETER SET ELEMENT
S70
QoS INDEX CALCULATION (SEE FIG. 2)
S72
S74
MORE BSS IN THE LIST?
NO
YES
S78
PICK BSS WITH THE HIGHEST QoS INDEX
S84
QoS INDEX DIFFERENCE>HYSTERESIS (TC)?
NO
YES
S82
UPDATE HYSTERESIS FOR THE STA
INITIATE H.O. & UPDATE THE HYSTERESIS FOR THE STA
END
S86
S86
END

FIG. 4

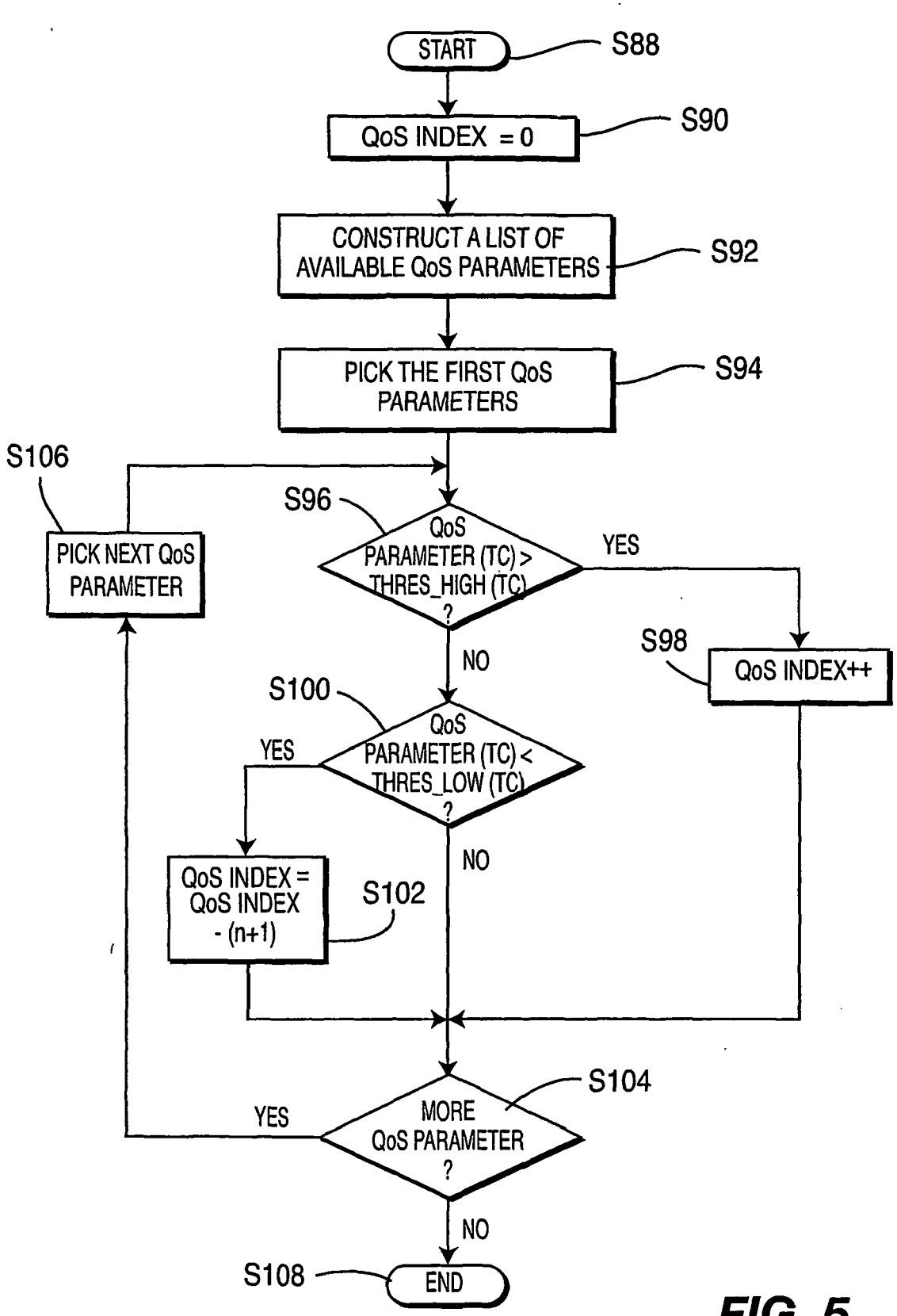
START
S88
QoS INDEX = 0
S90
CONSTRUCT A LIST OF AVAILABLE QoS PARAMETERS
S92
PICK THE FIRST QoS PARAMETERS
S94
S106
S96
QoS PARAMETER (TC) > THRES_HIGH (TC) ?
YES
PICK NEXT QoS PARAMETER
S98
QoS INDEX++
NO
S100
QoS PARAMETER (TC) < THRES_LOW (TC) ?
YES
NO
QoS INDEX = QoS INDEX - (n+1)
S102
S104
MORE QoS PARAMETER ?
YES
NO
S108
END

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 20030069018 A **[0004]**
- US 20030142651 A **[0005]**
- EP 1206069 A **[0006]**