フェース（ネットワークデバイス）の品質が低下状態か通常状態かを判断する。低下状態ならば設定はそのままなので変えずに、ステップＳ６１へ戻る。通常状態の場合はステップＳ６３へ行く。

〔Ｓ６３〕イベント対象のネットワークデバイスの設定を通常状態から低下状態に設定する。

〔Ｓ６４〕イベント対象のネットワークデバイスがメインインタフェースか否かを判断する。メインでなければステップＳ６１へ戻り、メインならばステップＳ６５へいく。

〔Ｓ６５〕ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ送信する。

〔Ｓ６６〕無線帯域不足イベントを受信した場合、イベント対象の現在のインタフェース（ネットワークデバイス）の品質が帯域不足状態か通常状態かを判断する。帯域不足状態ならば設定はそのままなので変えずに、ステップＳ６１へ戻る。通常状態の場合はステップＳ６７へ行く。

〔Ｓ６７〕イベント対象のネットワークデバイスの設定を通常状態から帯域不足状態に設定し、ステップＳ６４へいく。

〔Ｓ６８〕電波強度復旧イベントを受信した場合、イベント対象の現在のインタフェース（ネットワークデバイス）の品質が低下状態か通常状態かを判断する。通常状態ならば設定はそのままなので変えずに、ステップＳ６１へ戻る。低下状態の場合はステップＳ６９へ行く。

〔Ｓ６９〕イベント対象のネットワークデバイスの設定を低下状態から通常状態に設定し、ステップＳ６５へいく。

〔Ｓ７０〕無線帯域復旧イベントを受信した場合、イベント対象の現在のインタフェース（ネットワークデバイス）の品質が不足状態か通常状態かを判断する。通常状態ならば設定はそのままなので変えずに、ステップＳ６１へ戻る。帯域不足状態の場合はステップＳ７１へ行く。

〔Ｓ７１〕イベント対象のネットワークデバイスの設定を不足状態から通常状態に設定し、ステップＳ６５へいく。

次にネットワーク切替え制御部１３ｂの動作について説明する。ネットワーク

切替え制御部１３ｂは、実装されているネットワークデバイスが、優先付けして管理する。ネットワーク切替え制御部１３ｂがネットワーク切替え要求を受信した場合、実装されているネットワークデバイスのネットワーク状態を優先度の高い順に検索し、最も優先される、通常状態のインタフェースを特定し、それをメインインタフェースとする。

メインインタフェースが変更された場合には、ネットワーク制御部１４へメインインタフェース変更要求を送信し、かつハンドオーバ実行部１３ｃへＲＳ送信要求をそれぞれ送信し、自身の状態をＲＡ受信待ちとする。そして、これを契機にネットワークのＡＲへＲＳが送信される。ＲＳは変更したメインインタフェースから出力される。

ＡＲからのＲＡ受信はパケット入力部１６から端末管理部１３ｄを通ってネットワーク切替え制御部１３ｂへ通知される。メインインタフェースでＲＡを受信すると、ネットワーク切替え制御部１３ｂはネットワーク制御部１４へ経路切替え要求を送信し、デフォルトルートの切替えを実施した後、ＨＡへのＢＵ送信をハンドオーバ実行部１３ｃへ要求する。最後にＨＡから返信されたＢＡ受信により、ハンドオーバは完了する。

図１３はネットワーク切替え制御部１３ｂの動作を示すフローチャートである。

〔Ｓ８１〕イベントを受信したか否かを判断する。受信した場合は、イベント種別で分岐する。

〔Ｓ８２〕ネットワーク切替え要求を受信した場合、すべてのネットワークについて優先度の高い順にステップＳ８２ａ～ステップＳ８２ｆの該当処理を行う。

〔Ｓ８２ａ〕インタフェース状態は通常状態か否かを判断する。通常でない場合はステップＳ８１へ、通常の場合はステップＳ８２ｂへいく。

〔Ｓ８２ｂ〕メインインタフェースとして該当のネットワークデバイスを選択する。

〔Ｓ８２ｃ〕メインインタフェースを変更するか否かを判断する。変更する場合はステップＳ８２ｄへ、変更しない場合はステップＳ８１へいく。

〔Ｓ８２ｄ〕ネットワーク制御部１４へメインインタフェース変更要求を送信する。

〔Ｓ８２ｅ〕ハンドオーバ実行部１３ｃへＲＳ送信要求を送信し、ステップＳ８２ｆへいく。

〔Ｓ８２ｆ〕状態をＲＡ受信待ちとし、ステップＳ８１へ戻る。

〔Ｓ８３〕イベント種別がＲＡ受信の場合、状態がＲＡ受信待ちか否かを判断する。ＲＡ受信待ちならステップＳ８３ａへいき、そうでなければ終了する。

〔Ｓ８３ａ〕メインインタフェースからの受信か否かを判断する。メインインタフェースからの受信の場合はステップＳ８３ｂへいき、そうでなければ終了する。

〔Ｓ８３ｂ〕ネットワーク制御部１４へ経路切替え要求を送信する。

〔Ｓ８３ｃ〕ハンドオーバ実行部１３ｃへＢＵ送信を要求する。

〔Ｓ８３ｄ〕状態をＢＡ受信待ちにし、ステップＳ８１へ戻る。

〔Ｓ８４〕イベント種別がＢＡ受信の場合、状態がＢＡ受信待ちか否かを判断する。ＢＡ受信待ちならステップＳ８４ａへいき、そうでなければ終了する。

〔Ｓ８４ａ〕メインインタフェースからの受信か否かを判断する。メインインタフェースからの受信の場合はステップＳ８４ｂへいき、そうでなければ終了する。

〔Ｓ８４ｂ〕状態をネットワーク切替え要求待ちにし、ステップＳ８１へ戻る。

図１４はネットワーク切替え制御部１３ｂの動作を示すフローチャートである。ネットワーク品質指標にもとづく切替え制御のフローチャートである。

〔Ｓ８５〕イベントを受信したか否かを判断する。受信した場合は、イベント種別で分岐する。

〔Ｓ８６〕ネットワーク切替え要求を受信した場合、すべてのネットワークについてネットワーク品質指標の高い順にステップＳ８６ａ～ステップＳ８６ｆの該当処理を行う。

〔Ｓ８６ａ〕インタフェース状態は通常状態か否かを判断する。通常でない場合はステップＳ８５へ、通常の場合はステップＳ８６ｂへいく。

〔Ｓ８６ｂ〕メインインタフェースとして該当のネットワークデバイスを選択する。

〔Ｓ８６ｃ〕メインインタフェースを変更するか否かを判断する。変更する場合はステップＳ８６ｄへ、変更しない場合はステップＳ８５へいく。

〔Ｓ８６ｄ〕ネットワーク制御部１４へメインインタフェース変更要求を送信す

る。

〔Ｓ８６ｅ〕ハンドオーバ実行部１３ｃへＲＳ送信要求を送信し、ステップＳ８６ｆへいく。

〔Ｓ８６ｆ〕状態をＲＡ受信待ちとし、ステップＳ８５へ戻る。

〔Ｓ８７〕イベント種別がＲＡ受信の場合、状態がＲＡ受信待ちか否かを判断する。ＲＡ受信待ちならステップＳ８７ａへいき、そうでなければ終了する。

〔Ｓ８７ａ〕メインインタフェースからの受信か否かを判断する。メインインタフェースからの受信の場合はステップＳ８７ｂへいき、そうでなければ終了する。

〔Ｓ８７ｂ〕ネットワーク制御部１４へ経路切替え要求を送信し、ステップＳ８５へ戻る。

〔Ｓ８７ｃ〕ハンドオーバ実行部１３ｃへＢＵ送信を要求する。

〔Ｓ８７ｄ〕状態をＢＡ受信待ちにする。

〔Ｓ８８〕イベント種別がＢＡ受信の場合、状態がＢＡ受信待ちか否かを判断する。ＢＡ受信待ちならステップＳ８８ａへいき、そうでなければ終了する。

〔Ｓ８８ａ〕メインインタフェースからの受信か否かを判断する。メインインタフェースからの受信の場合はステップＳ８８ｂへいき、そうでなければ終了する。

〔Ｓ８８ｂ〕状態をネットワーク切替え要求待ちにし、ステップＳ８５へ戻る。

次にネットワーク制御部１４の動作について説明する。ネットワーク制御部１４は、メインインタフェース変更要求を受信した場合は、メインインタフェースの切替えを行い、また経路切替え要求を受信した場合は、デフォルトルートを指定のインタフェース方向とし、それ以外のインタフェースへの送信経路を無効にすることで、指定インタフェース向け以外にパケットが送信できないようにする。

図１５は経路制御用のルータ情報リストを示す図である。ルータ情報リストＴ２は、ネットワーク制御部１４で管理される。図において最上段にあるルータ情報に対応したインタフェースがメインインタフェースである。

ルータ情報リストＴ２の各項目に対し、ルータリスト識別子とは、無線ＬＡＮのルータリストなのか携帯電話ネットワークのルータリストなのか等を示す識別子である。ルータアドレスとは、該当ネットワークデバイスの現在の通信において接続するルータのアドレスである。デバイス名とは、ネットワークデバイスの

名称（無線ＬＡＮデバイスなのか携帯電話ネットワークデバイスなのか）である。

電波強度状態とは、現在の通信における電波強度である。帯域状態とは、現在の通信における無線帯域品質である。デバイス状態とは、該当ネットワークデバイスが使用可か不可かが示される。ネットワーク状態とは、メインインタフェースとして現在使われているか否かが示される。

図１６はネットワーク制御部１４の動作を示すフローチャートである。

〔Ｓ９１〕イベントを受信したか否かを判断する。受信した場合は、イベント種別で分岐する。

〔Ｓ９２〕経路切替え要求を受信した場合、デフォルトルートを指定のインタフェース方向とする。

〔Ｓ９３〕指定インタフェース以外の送信経路を無効にし、ステップＳ９１へ戻る。

〔Ｓ９４〕メインインタフェース変更要求を受信した場合、メインインタフェースを指定のネットワークインタフェースに切替え、ステップＳ９１へ戻る。

次にネットワークデバイスの停止・起動に伴う本発明のハンドオーバについて説明する。ネットワークデバイス１１の起動・停止の操作はアプリケーション１５から可能であるが、本発明では停止が要求されて実際にネットワークデバイスが停止する前にあらかじめインタフェースを切替えることにより、ハンドオーバ処理を高速に行う。これにより、使用中インタフェースの停止に伴うパケットロスを減らすことができる。

また、ネットワークデバイス１１が停止状態にあるとき、起動を要求された場合にはインタフェースの起動処理を実施した後に切替えを要求する。これは起動処理が完了する前に切替え要求を送信すると、通信できないネットワークデバイスを向いたネットワークがデフォルトルートになりパケットの損失が発生する可能性があるためである。

ネットワーク制御部１４内のインタフェース処理部１４ｂは、インタフェースの停止要求を受信した場合、ネットワークデバイスの品質を停止の状態に変更した後、ネットワーク切替え制御部１３ｂへネットワーク切替え要求を送信する。

そして、ネットワーク切替え制御部１３ｂにおいて、ネットワーク品質が通常

状態のネットワークデバイスのうち優先順位が最も高いものが選択され、そのデバイスの向いたネットワークへのハンドオーバ処理が行われる。

その後、インタフェース処理部１４ｂは、ネットワークデバイスのインタフェースを切断する。また、デバイス起動要求を受信した場合には、ネットワークデバイスの起動処理実行後に、ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ送信する。

図１７はインタフェース処理部１４ｂの動作を示すフローチャートである。

〔Ｓ１０１〕イベントを受信したか否かを判断する。受信した場合は、イベント種別で分岐する。

〔Ｓ１０２ａ〕起動要求を受信した場合、デバイス状態が通常か否かを判断する。通常ならステップＳ１０１へ戻り、そうでなければステップＳ１０２ｂへいく。

〔Ｓ１０２ｂ〕デバイス起動処理を行う。

〔Ｓ１０２ｃ〕デバイスの品質を通常状態にする。

〔Ｓ１０２ｄ〕ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ通知し、ステップＳ１０１へ戻る。

〔Ｓ１０３ａ〕停止要求を受信した場合、デバイス状態が通常か否かを判断する。通常ならステップＳ１０１へ戻り、そうでなければステップＳ１０３ｂへいく。

〔Ｓ１０３ｂ〕デバイスの品質を停止予約状態にする。

〔Ｓ１０３ｃ〕ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ通知し、ステップＳ１０１へ戻る。

〔Ｓ１０４〕切替え完了通知を受信した場合、停止予約状態のデバイスをすべて停止し、状態を停止にし、ステップＳ１０１へ戻る。

以上説明したように、上位アプリケーションからのインタフェースダウン（停止）処理が要求された場合に、対象となるインタフェースが接続されたネットワークが、カレントネットワークの場合は、即座にダウン（停止）処理を実施するのではなく、他のネットワークへのネットワーク切替処理及びハンドオーバ制御を実施し、処理完了後にダウン（停止）処理を実施する。これにより、モバイルノード１０が通信中であってもインタフェースダウン処理により、通信を中断することなく通信を継続することが可能になる。

次にリンクの切断・接続に伴う本発明のハンドオーバについて説明する。ネットワークの接続・切断の操作は、アプリケーション１５から可能であるが、本発明では、リンク切断が要求されて実際に切断する前にあらかじめネットワークを切替えてハンドオーバ処理を高速に行う。これにより、使用中ネットワークの停止に伴うパケットロスを減らすことができる。

また、ネットワークデバイスが切断状態にあるとき、リンク接続を要求された場合は、インタフェースの接続処理を実施した後に切替えを要求する。これはリンク接続処理が完了する前に切替え要求を送信すると、通信できないネットワークがデフォルトルートになりパケットの損失が発生する可能性があるためである。

図１８はリンク処理部１４ｃの動作を示すフローチャートである。

〔Ｓ１１１〕イベントを受信したか否かを判断する。受信した場合は、イベント種別で分岐する。

〔Ｓ１１２ａ〕起動要求を受信した場合、リンク状態が接続か否かを判断する。接続ならステップＳ１１１へ戻り、そうでなければステップＳ１１２ｂへいく。

〔Ｓ１１２ｂ〕リンク接続処理を行う。

〔Ｓ１１２ｃ〕リンク状態を通常状態にする。

〔Ｓ１１２ｄ〕ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ通知し、ステップＳ１１１へ戻る。

〔Ｓ１１３ａ〕切断要求を受信した場合、リンク状態が接続か否かを判断する。接続ならステップＳ１１１へ戻り、そうでなければステップＳ１１３ｂへいく。

〔Ｓ１１３ｂ〕リンクの状態を切断予約状態にする。

〔Ｓ１１３ｃ〕ネットワーク切替え要求をネットワーク切替え制御部１３ｂへ通知し、ステップＳ１１１へ戻る。

〔Ｓ１１４〕切替え完了通知を受信した場合、切断予約状態のネットワークをすべて切断し、状態を切断にし、ステップＳ１１１へ戻る。

以上説明したように、上位アプリケーションからの電話切断等のリンク切断処理が要求された場合に、対象となるリンクが、カレントネットワークの場合は、即座にリンク切断処理を実施するのではなく、他のネットワークへのネットワーク切替え処理及びハンドオーバ制御を実施し、処理完了後にリンク切断処理を実

施する。これにより、モバイルノードが通信中であってもリンク切断処理により、通信を中断することなく通信を継続することが可能になる。

次にアクセスポイントを切替えることによる本発明のハンドオーバについて説明する。図１９はアクセスポイント切替えのハンドオーバを説明するための図である。無線ＬＡＮは、アクセスポイント５１、５２と接続する。最初、モバイルノード１０はアクセスポイント５１を介して通信を行っているとする。

アクセスポイント５１の電波強度が低下すると、モバイルノード１０は、ハンドオーバを行う。上述してきたハンドオーバでは、異種ネットワーク間のハンドオーバを対象にしたが、ここの例では同一のネットワーク内のアクセスポイントを切替えるものとする。

図の場合、アクセスポイント５１の電波強度が低下した場合には、切替え先をアクセスポイント５２にしてハンドオーバを行う。このように、接続中の無線通信の電波強度が弱まったとき、次の接続先メディア候補として無線ＬＡＮが選択された場合、現在接続の無線通信が接続不可となる前に接続可能なアクセスポイントを検索する。そして、接続中の無線通信との接続が維持できなくなった際、事前に検索しておいたアクセスポイントへ瞬時にハンドオーバを実現し通信を継続する。なお、このようなアクセスポイントのハンドオーバの詳細制御は、異種ネットワーク間のハンドオーバ制御と同様であるため、詳細制御の説明は省略する。

また、上記の例では、同一の無線ＬＡＮにおけるアクセスポイントの切替えについて示したが、異なる無線ＬＡＮ間でアクセスポイントの切替えを行ってもよい（例えば、無線ＬＡＮ５ａ上のアクセスポイント５１ａから無線ＬＡＮ５ｂ上のアクセスポイント５１ｂへの切替え）。

以上説明したように、本発明によれば、モバイルＩＰネットワーク上でのハンドオーバにおいて、ネットワークとの通信中断時間が皆無となるのでパケットロスの発生をなくすことができる。したがって、音声や画像などのＩＰ通信が途切れることなく、ネットワークのシームレスなハンドオーバをユーザに提供することが可能になる。

例えば、ユーザが本発明の機能を実装したＩＰ電話を用いて、通話を行ってい

る場合にネットワーク切替えに伴う通信中断をユーザに意識させることがない。また、ユーザが動画などのストリーミングデータを見ながら移動している場合にも、ネットワーク切替えに伴う動画の停止等が起きない。

さらに、本発明によれば、電波強度／無線帯域のそれぞれの閾値に対して、低下閾値及び復旧閾値を設け、ネットワークの切替え制御を行うことにより、安定した状態でのネットワーク接続を制御することができる。このため、無線ネットワークの境界付近等の電波強度が変化する領域であっても、ネットワークのバタツキ及びそれに伴うノイズの発生を最小限に抑えることができ、安定した品質のよい通信をユーザに提供することが可能になる。

以上説明したように、本発明のモバイルノードは、ネットワーク品質の状態に応じて、通信が切断される前に、気付アドレスをアドレス登録先へ送信して、通信情報の経路を変更し、あらたなネットワークに接続先を切替えるためのハンドオーバを行い、気付アドレスがアドレス登録先で更新され、通信が切断されるまでは、切替え前のネットワークとの受信機能を維持する構成とした。これにより、通信中断時間を皆無とし、また通信の継続性を良好に維持することができるので、モバイルＩＰネットワーク上での通信品質の向上を図ることが可能になる。

上記については単に本発明の原理を示すものである。さらに、多数の変形、変更が当業者にとって可能であり、本発明は上記に示し、説明した正確な構成および応用例に限定されるものではなく、対応するすべての変形例および均等物は、添付の請求項およびその均等物による本発明の範囲とみなされる。

請 求 の 範 囲

1． モバイルＩＰネットワーク上で通信を行うモバイルノードにおいて、

ネットワークと接続するインタフェース機能を有するネットワークデバイスと、

前記ネットワークデバイスが受信する電波強度または無線帯域の少なくとも一方にもとづいて、ネットワーク品質を監視するネットワーク品質監視部と、

ネットワーク品質の状態に応じて、通信が切断される前に、気付アドレスをアドレス登録先へ送信して、通信情報の経路を変更し、あらたなネットワークに接続先を切替えるためのハンドオーバを行うハンドオーバ制御部と、

前記気付アドレスがアドレス登録先で更新されたことを示す応答を受信し、通信が切断されるまでは、切替え前のネットワークとの受信機能を維持するネットワーク制御部と、

を有することを特徴とするモバイルノード。

2． 前記ネットワーク品質監視部は、現在通信しているネットワークのネットワーク品質の低下を認識すると、前記ハンドオーバ制御部は、あらたなネットワークへ接続先を切替えることを特徴とする請求の範囲第１項記載のモバイルノード。

3． 前記ネットワーク品質監視部は、切替え前のネットワークのネットワーク品質が復旧したことを認識すると、前記ハンドオーバ制御部は、元の切替え前のネットワークに接続先を戻すことを特徴とする請求の範囲第１項記載のモバイルノード。

4． 前記ハンドオーバ制御部は、ネットワーク接続の優先順位を記憶し、ネットワーク品質の変化に応じて、優先順位の高いネットワークへハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

5． 前記ネットワーク品質監視部は、電波の品質低下を検出するための低下閾値と、品質復旧を検出するための復旧閾値とを有し、前記ハンドオーバ制御部は、受信する電波の品質が低下閾値を下回った場合には、ネットワーク品質低下に伴うハンドオーバを行い、受信する電波の品質が復旧閾値を上回った場合には、ネットワーク復旧に伴うハンドオーバを行うことを特徴とする請求の範囲第１項記

載のモバイルノード。

６． 前記ネットワーク品質監視部は、受信する電波の品質が低下閾値を一定時間安定して下回った場合に、ネットワーク品質の低下と認識してハンドオーバ要求を出力し、受信する電波の品質が復旧閾値を一定時間安定して上回った場合に、ネットワーク復旧と認識してハンドオーバ要求を出力することを特徴とする請求の範囲第５項記載のモバイルノード。

７． 前記ネットワーク品質監視部は、急激劣化閾値を有し、受信する電波が前記急激劣化閾値を下回った場合には、ネットワーク品質の低下と認識して即時にハンドオーバ要求を出力し、前記ハンドオーバ制御部は、ハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

８． 前記ネットワーク品質監視部は、現在利用可能な無線帯域の不足を検出するための不足閾値と、無線帯域不足の復旧を検出するための復旧閾値とを有し、前記ハンドオーバ制御部は、無線帯域が不足閾値を下回った場合には、ネットワーク品質低下に伴うハンドオーバを行い、無線帯域が復旧閾値を上回った場合には、ネットワーク復旧に伴うハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

９． 前記ネットワーク品質監視部は、固定または可変に設定された周期でのネットワーク品質の監視、またはパケット受信を契機としたネットワーク品質の監視の少なくとも一方を行うことを特徴とする請求の範囲第１項記載のモバイルノード。

１０． 前記ネットワーク制御部が、前記ネットワークデバイスの停止要求を検出した場合は、前記ハンドオーバ制御部は、前記ネットワークデバイスが停止する前にハンドオーバを行い、前記ネットワーク制御部が、前記ネットワークデバイスの起動要求を検出した場合は、前記ハンドオーバ制御部は、前記ネットワークデバイスの起動処理完了後にハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

１１． 前記ネットワーク制御部が、前記ネットワークデバイスが使用するネットワークとのリンクの切断要求を検出した場合、前記ハンドオーバ制御部は、リンクが切断する前にハンドオーバを行い、前記ネットワーク制御部が前記ネット

ワークデバイスの接続要求を検出した場合は、前記ハンドオーバ制御部は、前記ネットワークデバイスの接続処理完了後にハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

１２．　前記ネットワーク品質監視部は、ネットワーク品質と優先度とに重み付けして算出したネットワーク品質指標を管理し、前記ハンドオーバ制御部は前記ネットワーク品質指標にもとづき、ハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

１３．　ネットワークに第１のアクセスポイントと第２のアクセスポイントが存在する際に、前記ネットワーク品質監視部は、現在通信中の第１のアクセスポイントからのネットワーク品質の低下を認識し、かつ第２のアクセスポイントのネットワーク品質から第２のアクセスポイントとの接続を可能と判断した場合は、前記ハンドオーバ制御部は、第１のアクセスポイントから第２のアクセスポイントへのハンドオーバを行うことを特徴とする請求の範囲第１項記載のモバイルノード。

１４．　モバイルＩＰネットワーク上での通信に対してハンドオーバを行うハンドオーバ方法において、

モバイルノードが複数のインタフェースのネットワークデバイスを実装し、モバイルノードが複数のネットワーク間を移動する場合であって、

前記ネットワークデバイスが受信する電波強度または無線帯域の少なくとも一方にもとづいて、ネットワーク品質を監視し、

ネットワーク品質の状態に応じて、通信が切断される前に、気付アドレスをアドレス登録先へ送信し、

前記気付アドレスがアドレス登録先で更新されたことを示す応答を受信し、通信が切断されるまでは、切替え前のネットワークとの受信機能を維持し、

前記気付アドレスの送信後に、通信情報の経路を変更し、あらたなネットワークに接続先を切替えるためのハンドオーバを行うことを特徴とするハンドオーバ方法。

１５．　現在通信しているネットワークのネットワーク品質の低下を認識すると、あらたなネットワークへ接続先を切替えることを特徴とする請求の範囲第１４項

記載のハンドオーバ方法。

１６．　切替え前のネットワークのネットワーク品質が復旧したことを認識すると、元の切替え前のネットワークに接続先を戻すことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

１７．　ネットワーク接続の優先順位を記憶し、ネットワーク品質の変化に応じて、優先順位の高いネットワークへハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

１８．　電波の品質低下を検出するための低下閾値と、品質復旧を検出するための復旧閾値とを有し、受信する電波の品質が低下閾値を下回った場合には、ネットワーク品質低下に伴うハンドオーバを行い、受信する電波の品質が復旧閾値を上回った場合には、ネットワーク復旧に伴うハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

１９．　受信する電波の品質が低下閾値を一定時間安定して下回った場合に、ネットワーク品質の低下と認識してハンドオーバを行い、受信する電波の品質が復旧閾値を一定時間安定して上回った場合に、ネットワーク復旧と認識してハンドオーバを行うことを特徴とする請求の範囲第１８項記載のハンドオーバ方法。

２０．　急激劣化閾値を有し、受信する電波が前記急激劣化閾値を下回った場合には、ネットワーク品質の低下と認識して、即時にハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２１．　現在利用可能な無線帯域の不足を検出するための不足閾値と、無線帯域不足の復旧を検出するための復旧閾値とを有し、無線帯域が不足閾値を下回った場合には、ネットワーク品質低下に伴うハンドオーバを行い、無線帯域が復旧閾値を上回った場合には、ネットワーク復旧に伴うハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２２．　固定または可変に設定された周期でのネットワーク品質の監視、またはパケット受信を契機としたネットワーク品質の監視の少なくとも一方を行うことを特徴とする請求の範囲第1.4項記載のハンドオーバ方法。

２３．　前記ネットワークデバイスの停止要求を検出した場合は、前記ネットワークデバイスが停止する前にハンドオーバを行い、前記ネットワークデバイスの

起動要求を検出した場合は、前記ネットワークデバイスの起動処理完了後にハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２４．　前記ネットワークデバイスが使用するネットワークとのリンクの切断要求を検出した場合は、リンクが切断する前にハンドオーバを行い、前記ネットワークデバイスの接続要求を検出した場合は、前記ネットワークデバイスの接続処理完了後にハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２５．　ネットワーク品質と優先度とに重み付けして算出したネットワーク品質指標にもとづき、ハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２６．　ネットワークに第１のアクセスポイントと第２のアクセスポイントが存在する際に、現在通信中の第１のアクセスポイントからのネットワーク品質の低下を認識し、かつ第２のアクセスポイントのネットワーク品質から第２のアクセスポイントとの接続を可能と判断した場合は、第１のアクセスポイントから第２のアクセスポイントへのハンドオーバを行うことを特徴とする請求の範囲第１４項記載のハンドオーバ方法。

２７．　モバイルＩＰネットワーク上で通信を行うモバイルＩＰシステムにおいて、

ネットワークと接続するインタフェース機能を有するネットワークデバイスと、前記ネットワークデバイスが受信する電波強度または無線帯域の少なくとも一方にもとづいて、ネットワーク品質を監視するネットワーク品質監視部と、ネットワーク品質の状態に応じて、通信が切断される前に、気付アドレスをアドレス登録先へ送信して、通信情報の経路を変更し、あらたな第１のネットワークに接続先を切替えるためのハンドオーバを行うハンドオーバ制御部と、前記気付アドレスがアドレス登録先で更新されたことを示す応答を受信し、通信が切断されるまでは、切替え前の第２のネットワークとの受信機能を維持するネットワーク制御部と、から構成されるモバイルノードと、

前記気付アドレスを受信し、前記モバイルノード宛の情報の配信及び位置を認識するホームエージェントと、

前記気付アドレスを受信するデフォルトルータと接続し、通信が切断されるまでは、第２のネットワークを介して通信情報を送信し、ハンドオーバ処理後、第１のネットワークを介して前記モバイルノードと通信を行うコレスポンデント・ノードと、

を有することを特徴とするモバイルＩＰシステム。

２８．　モバイルＩＰネットワーク上で通信を行うモバイルノードにおいて、

複数の異なるモバイルＩＰネットワークと通信可能なインタフェース機能を有するネットワークデバイスと、

前記ネットワークデバイスを介して、複数のモバイルＩＰネットワークの各品質状態に応じて、現在の通信しているモバイルＩＰネットワークから他方のモバイルＩＰネットワークに切替えを行うハンドオーバ制御部と、

を有することを特徴とするモバイルノード。

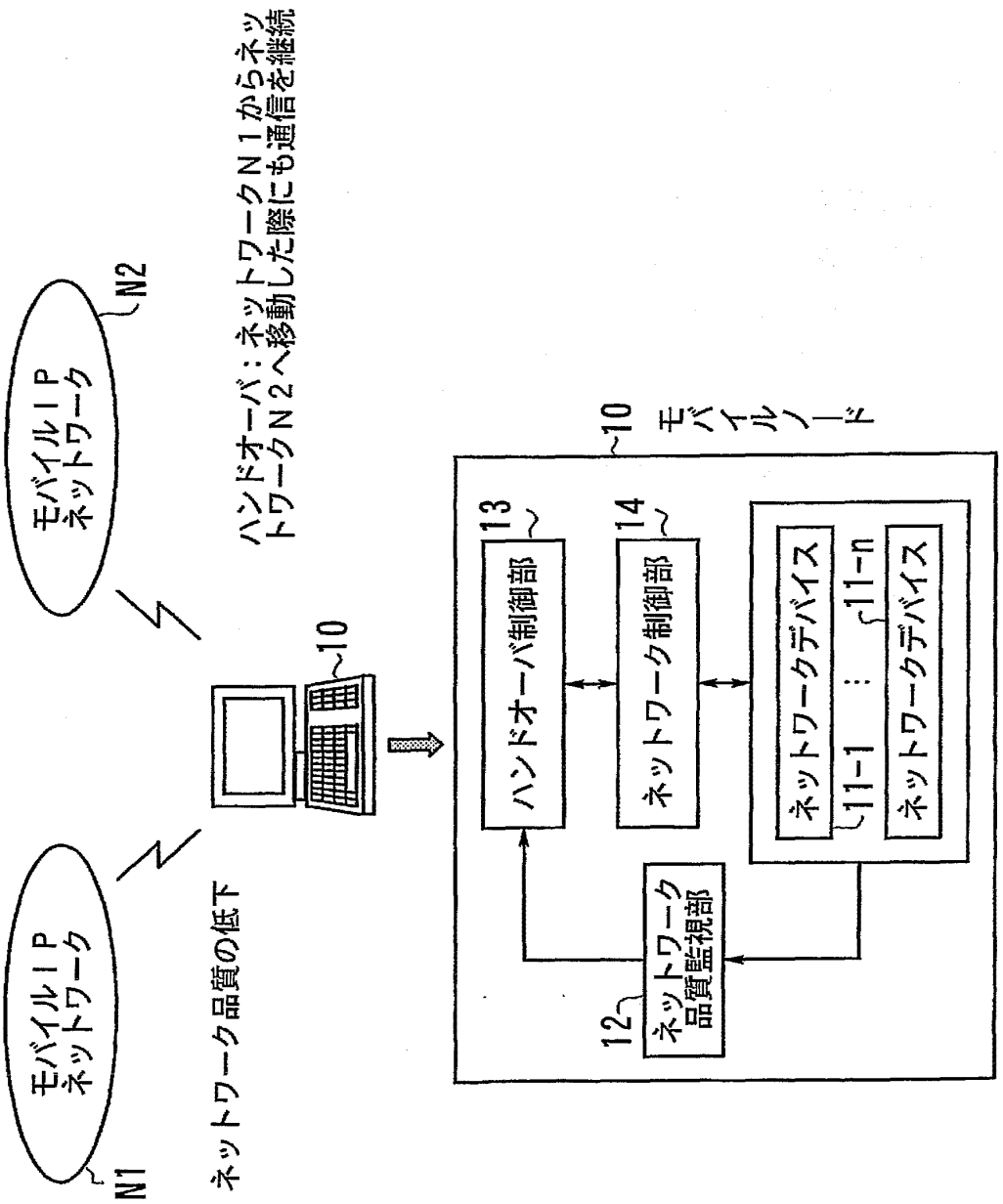

モバイルＩＰ
ネットワーク
N1
N2
ネットワーク品質の低下
ハンドオーバ：ネットワークＮ１からネットワークＮ２へ移動した際にも通信を継続
10
モバイルノード
ハンドオーバ制御部
13
ネットワーク制御部
14
ネットワークデバイス
11-1
11-n
ネットワークデバイス
ネットワーク品質監視部
12

図１

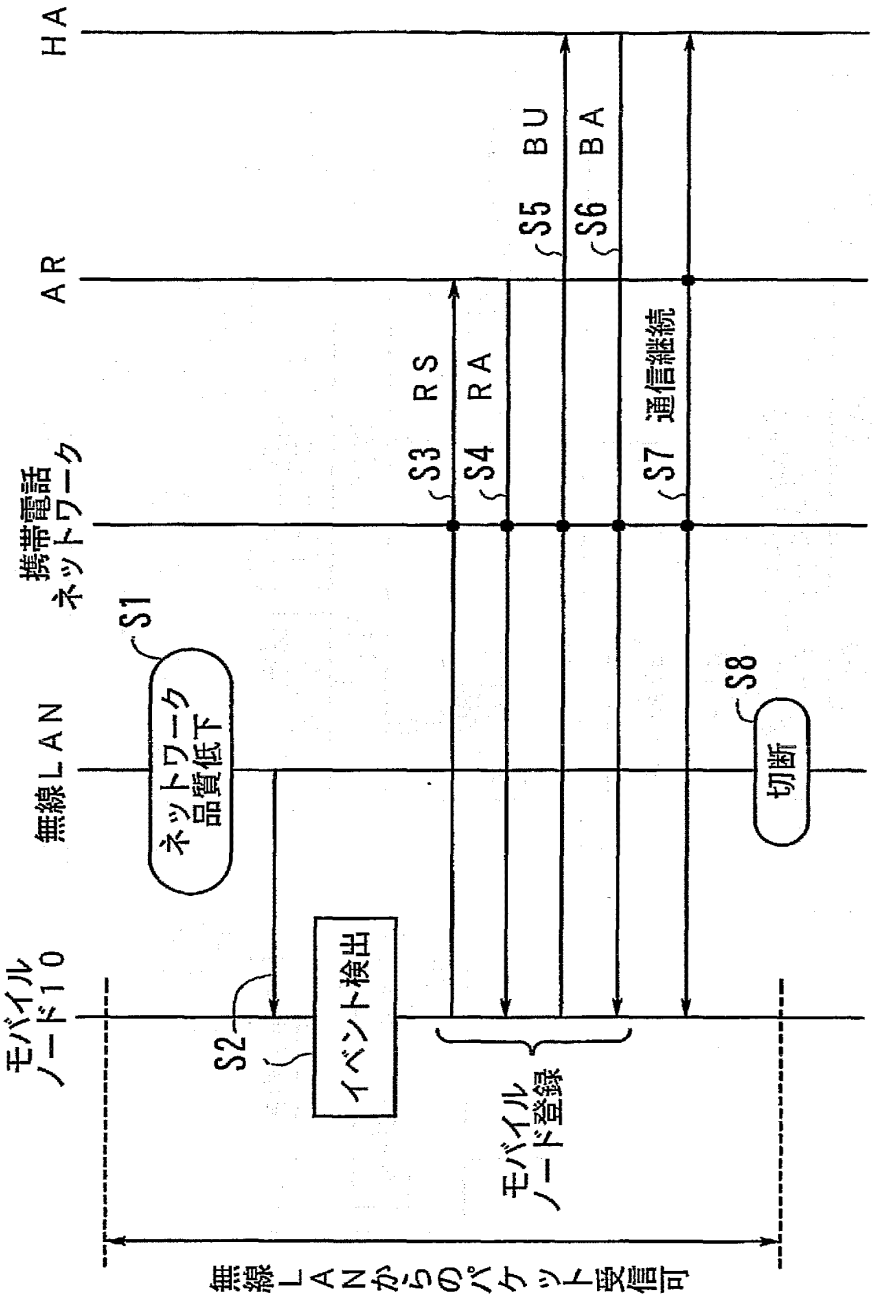

HA
AR
携帯電話ネットワーク
無線LAN
モバイルノード10
S1
ネットワーク品質低下
S2
イベント検出
S3 RS
S4 RA
S5 BU
S6 BA
S7 通信継続
S8
切断
モバイルノード登録
無線LANからのパケット受信可

図2

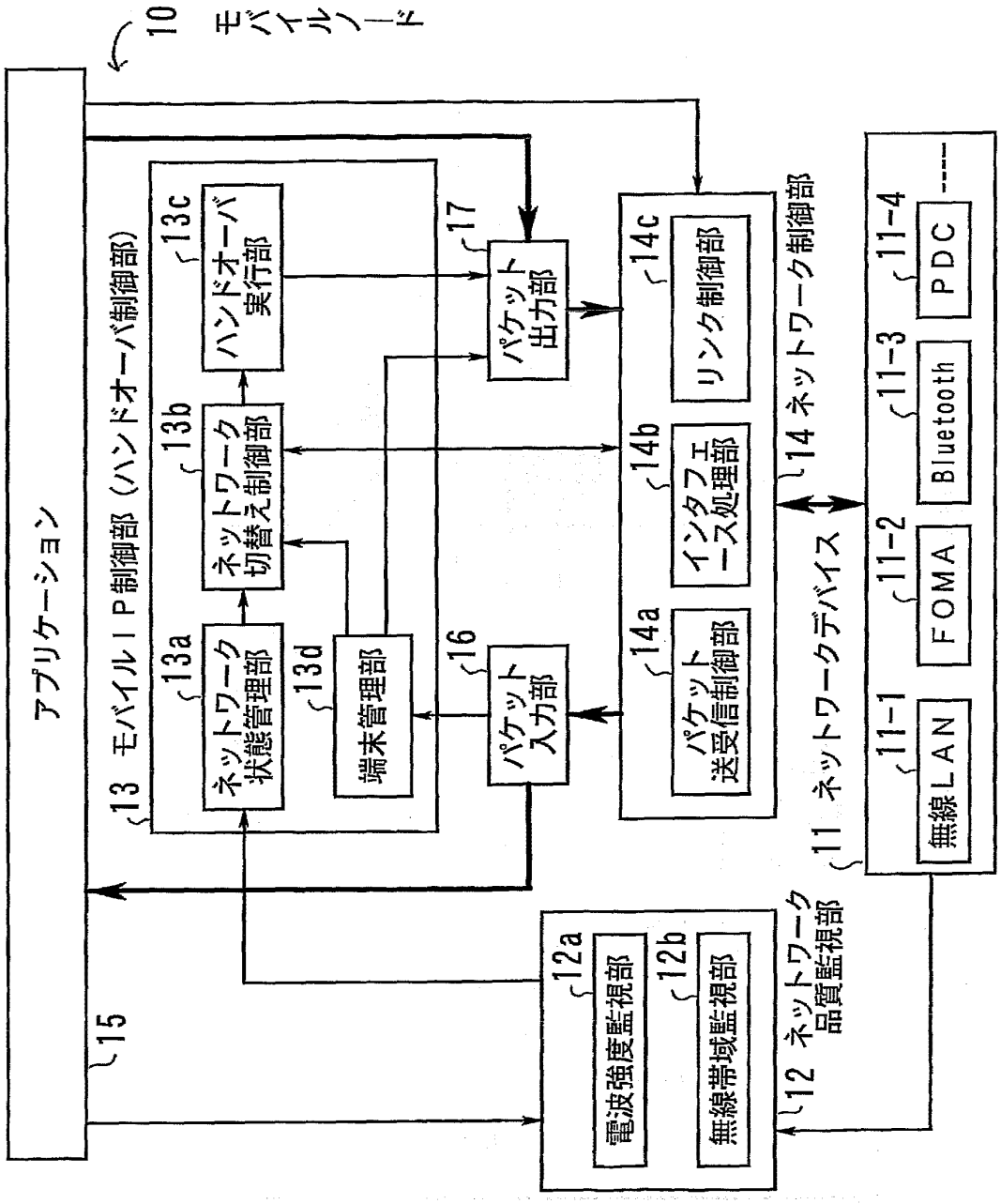

10 モバイルノード
アプリケーション
13 モバイルIP制御部（ハンドオーバ制御部）
13a ネットワーク状態管理部
13b ネットワーク切替え制御部
13c ハンドオーバ実行部
13d 端末管理部
16 パケット入力部
17 パケット出力部
15
12 ネットワーク品質監視部
12a 電波強度監視部
12b 無線帯域監視部
11 ネットワークデバイス
11-1 無線LAN
11-2 FOMA
11-3 Bluetooth
11-4 PDC
14 ネットワーク制御部
14a パケット送受信制御部
14b インタフェース処理部
14c リンク制御部

図3

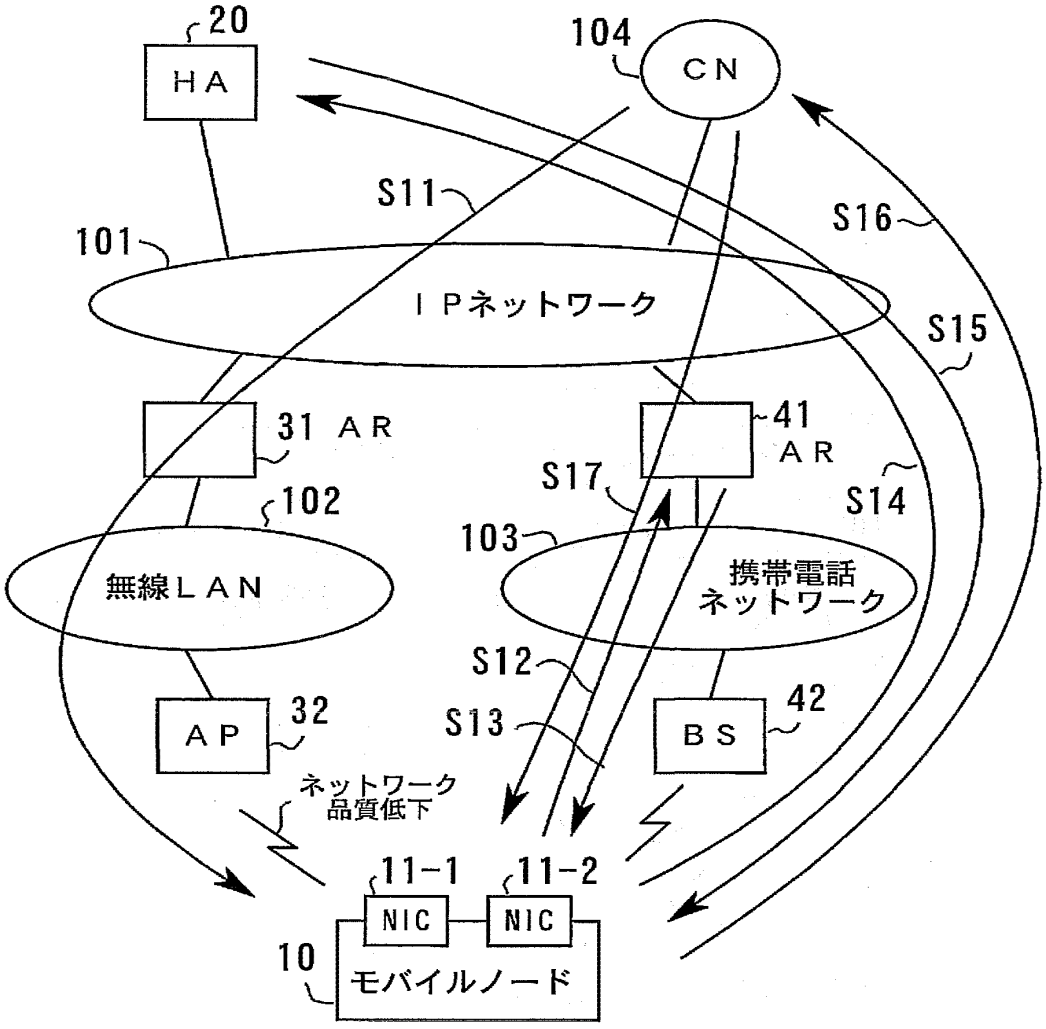

20
HA
104
CN
S11
S16
101
IPネットワーク
S15
31 AR
41
AR
S17
S14
102
103
無線LAN
携帯電話
ネットワーク
S12
S13
AP
32
BS
42
ネットワーク
品質低下
11-1
11-2
NIC
NIC
10
モバイルノード

図 4

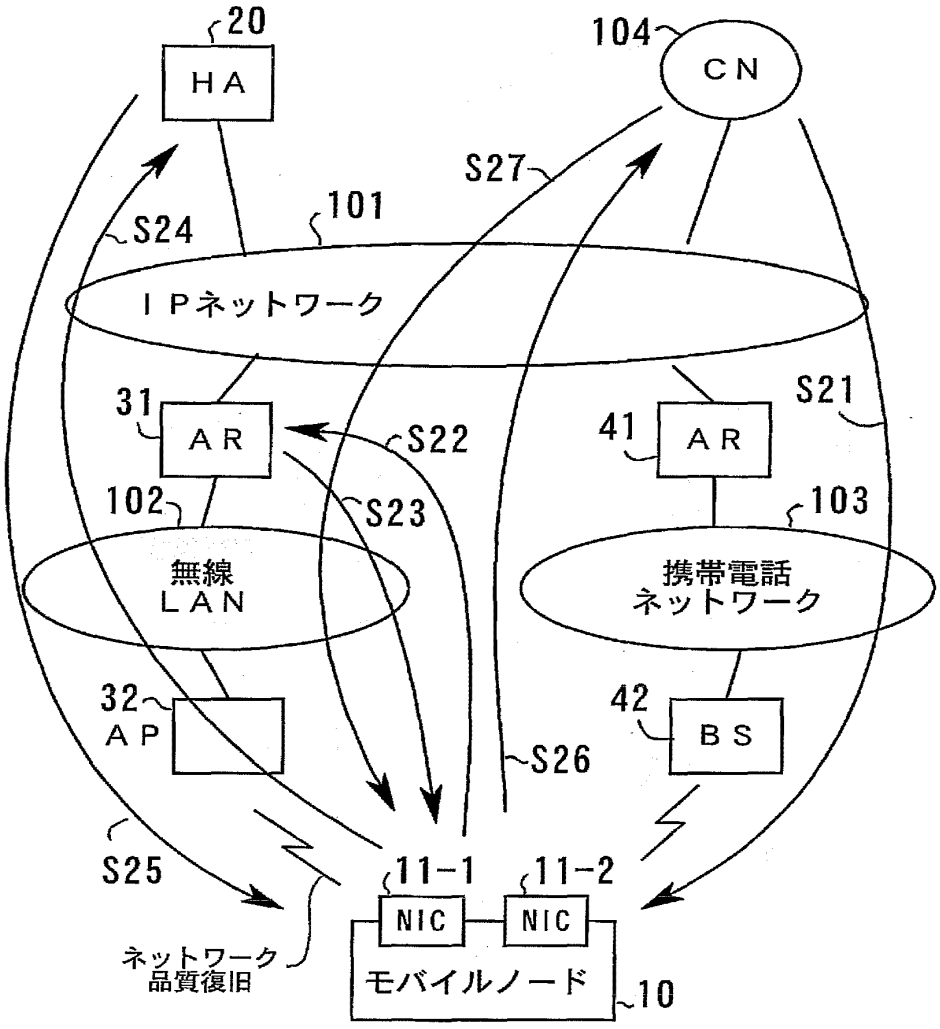

20
HA
104
CN
S27
S24
101
IPネットワーク
31
AR
S22
41
AR
S21
102
S23
103
無線
LAN
携帯電話
ネットワーク
32
AP
42
BS
S26
S25
11-1
11-2
NIC
NIC
ネットワーク
品質復旧
モバイルノード
10

図 5

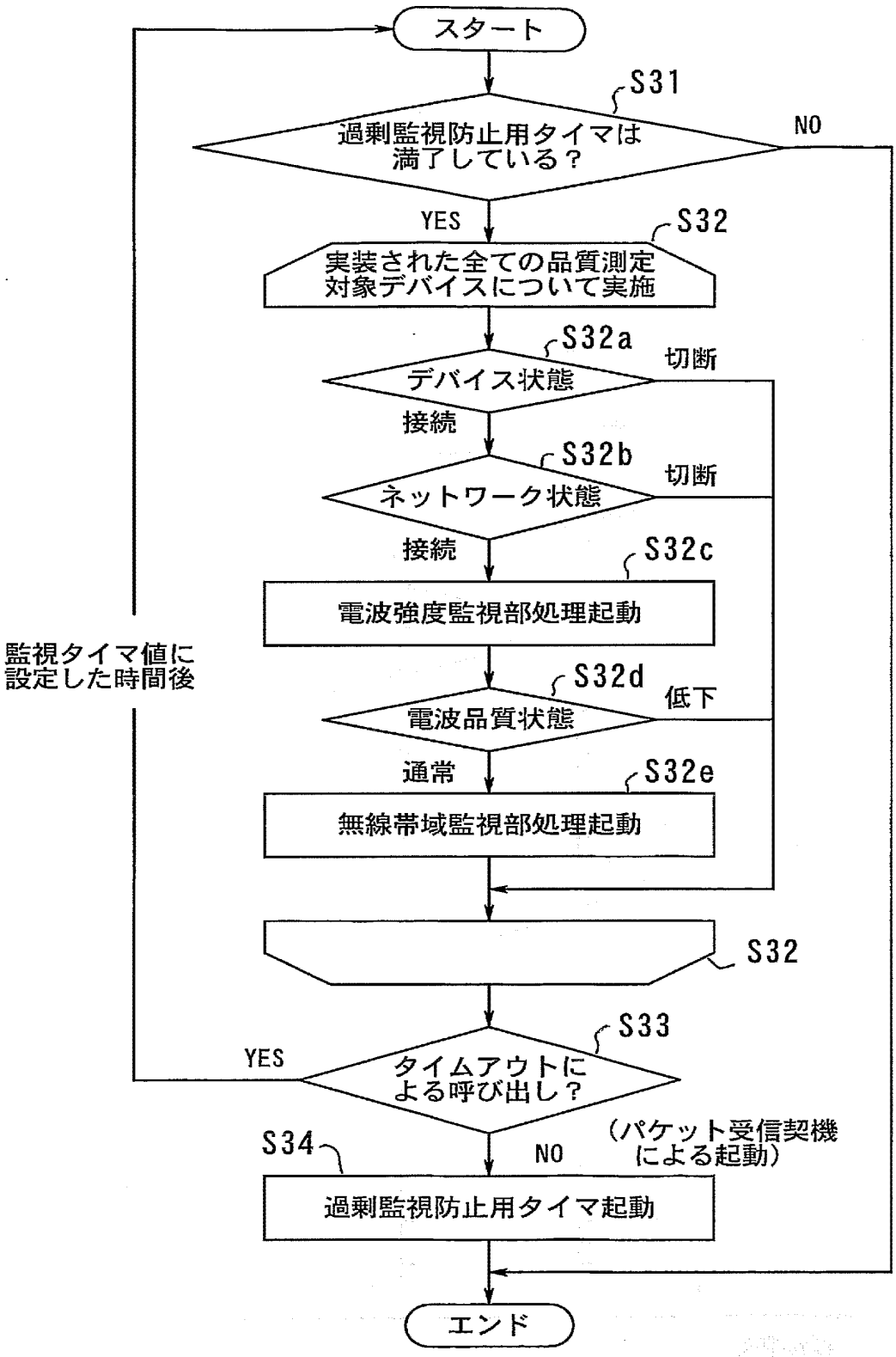

スタート
S31
過剰監視防止用タイマは満了している？
NO
YES
S32
実装された全ての品質測定対象デバイスについて実施
S32a
デバイス状態
切断
接続
S32b
ネットワーク状態
切断
接続
S32c
電波強度監視部処理起動
S32d
電波品質状態
低下
通常
S32e
無線帯域監視部処理起動
S32
S33
タイムアウトによる呼び出し？
YES
監視タイマ値に設定した時間後
S34
NO
（パケット受信契機による起動）
過剰監視防止用タイマ起動
エンド

図６

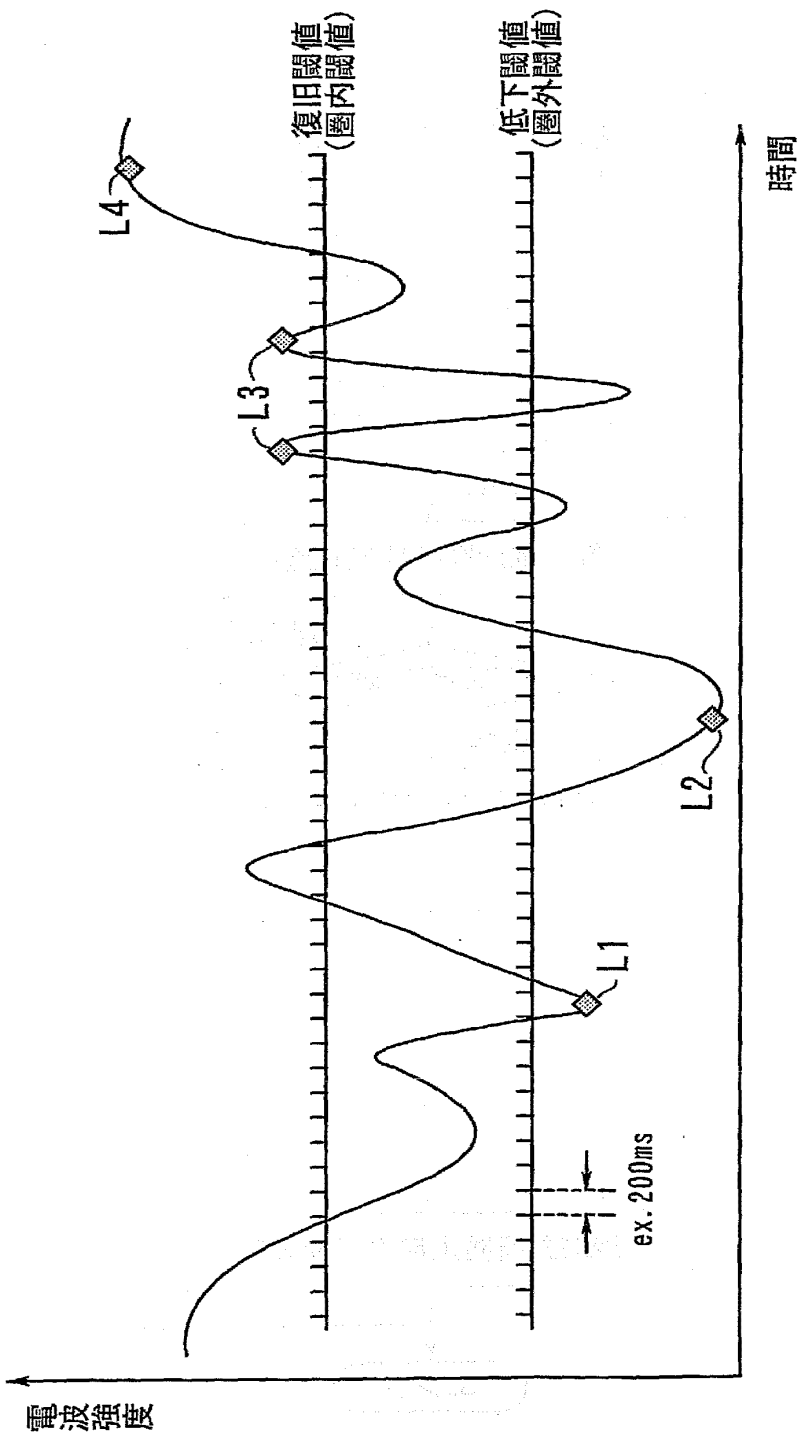


図7

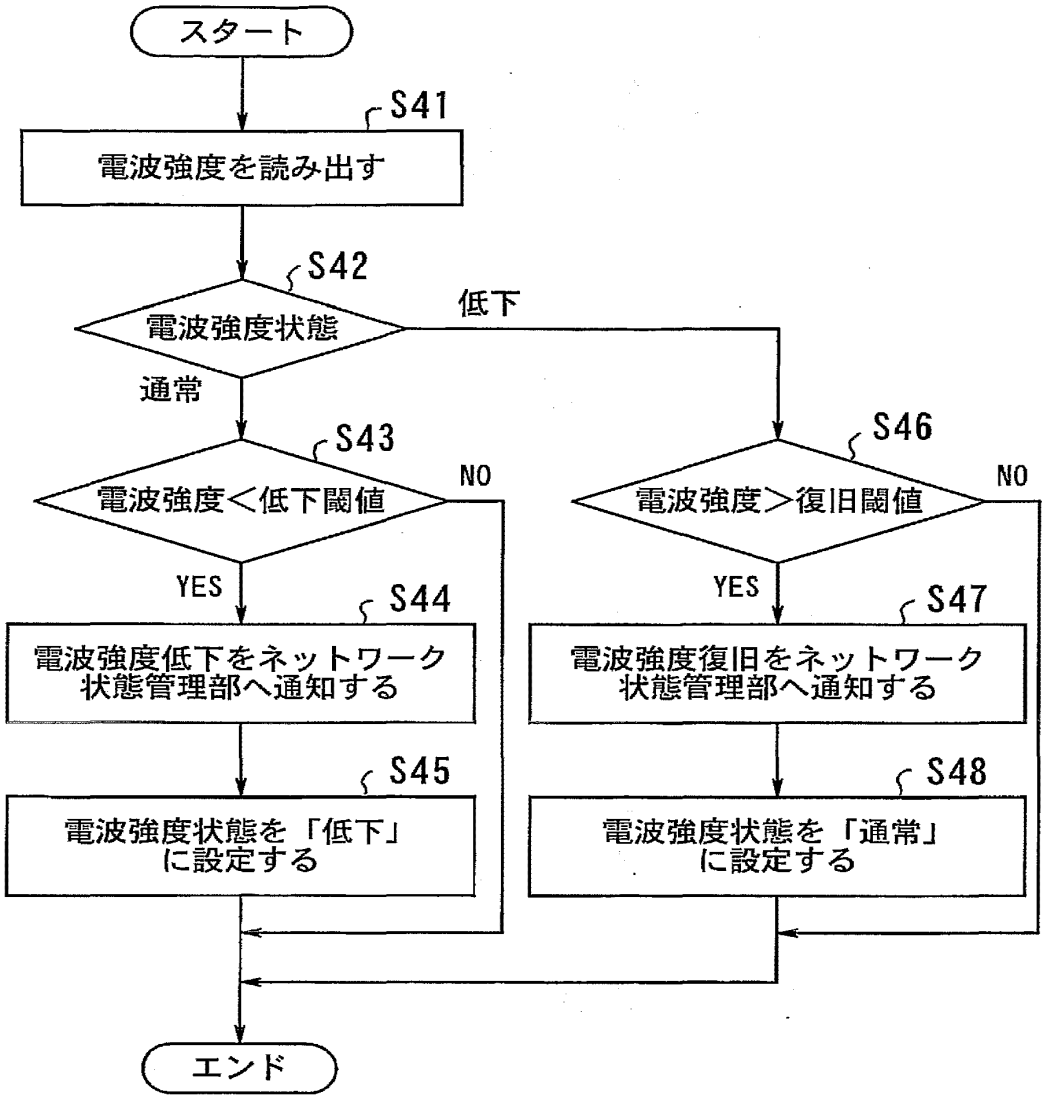

スタート
S41
電波強度を読み出す
S42
電波強度状態
低下
通常
S43
電波強度＜低下閾値
NO
YES
S44
電波強度低下をネットワーク状態管理部へ通知する
S45
電波強度状態を「低下」に設定する
S46
電波強度＞復旧閾値
NO
YES
S47
電波強度復旧をネットワーク状態管理部へ通知する
S48
電波強度状態を「通常」に設定する
エンド

図８

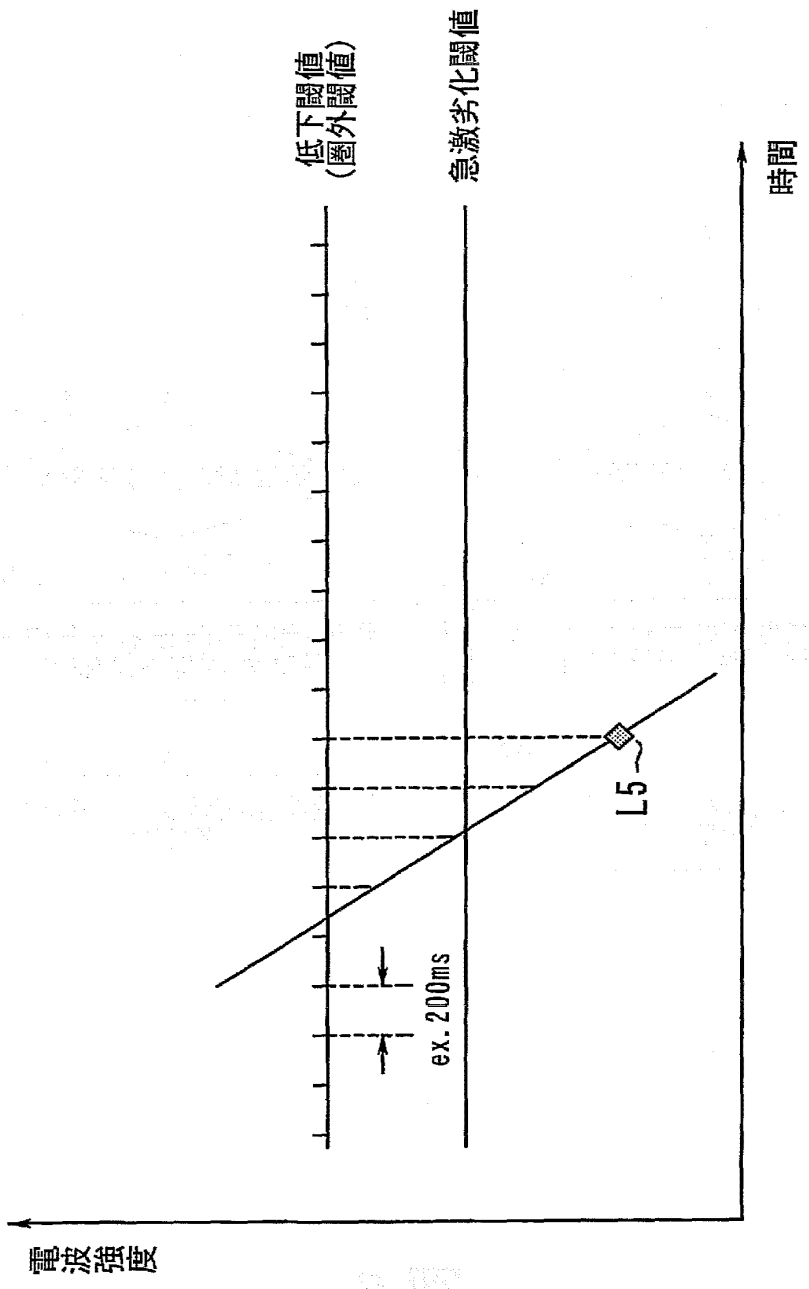


図9

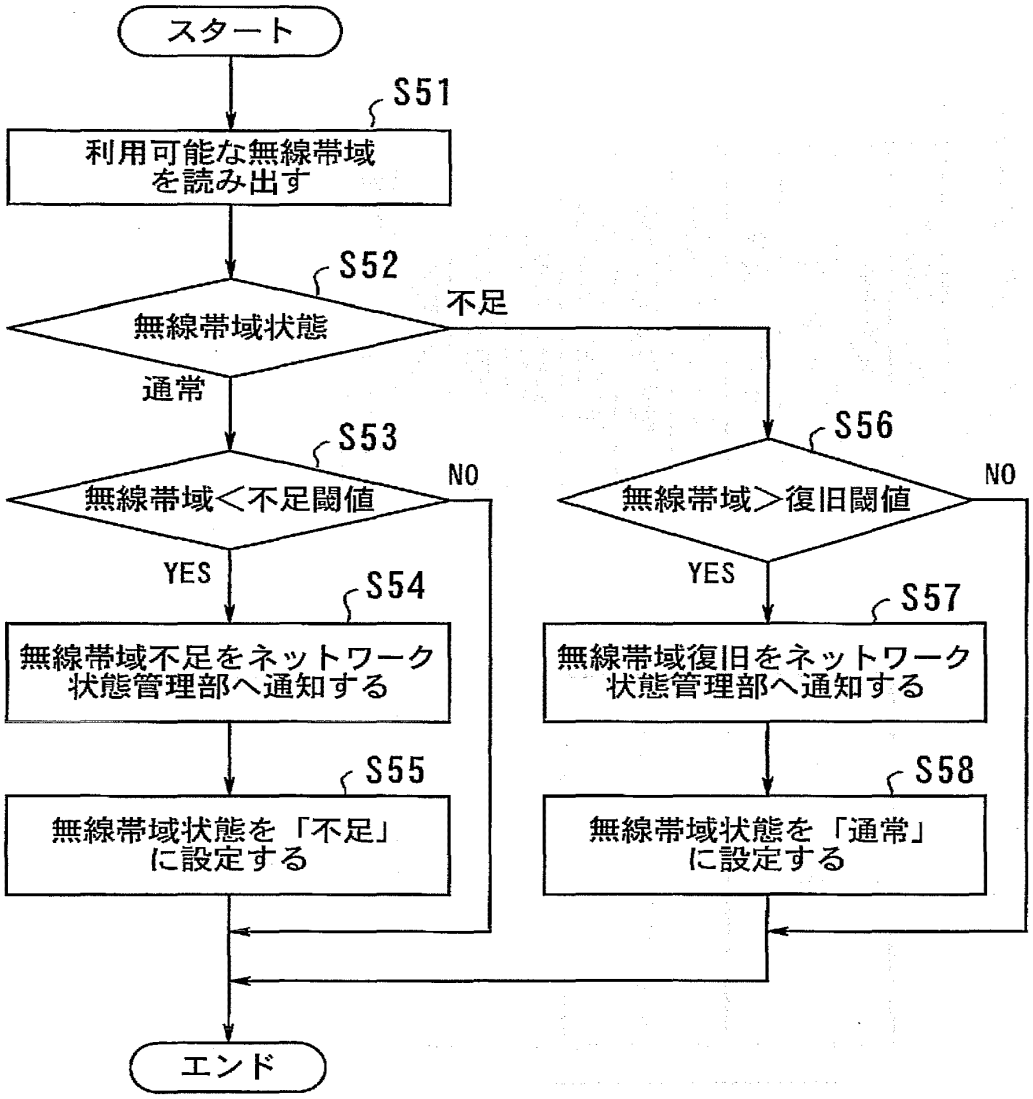
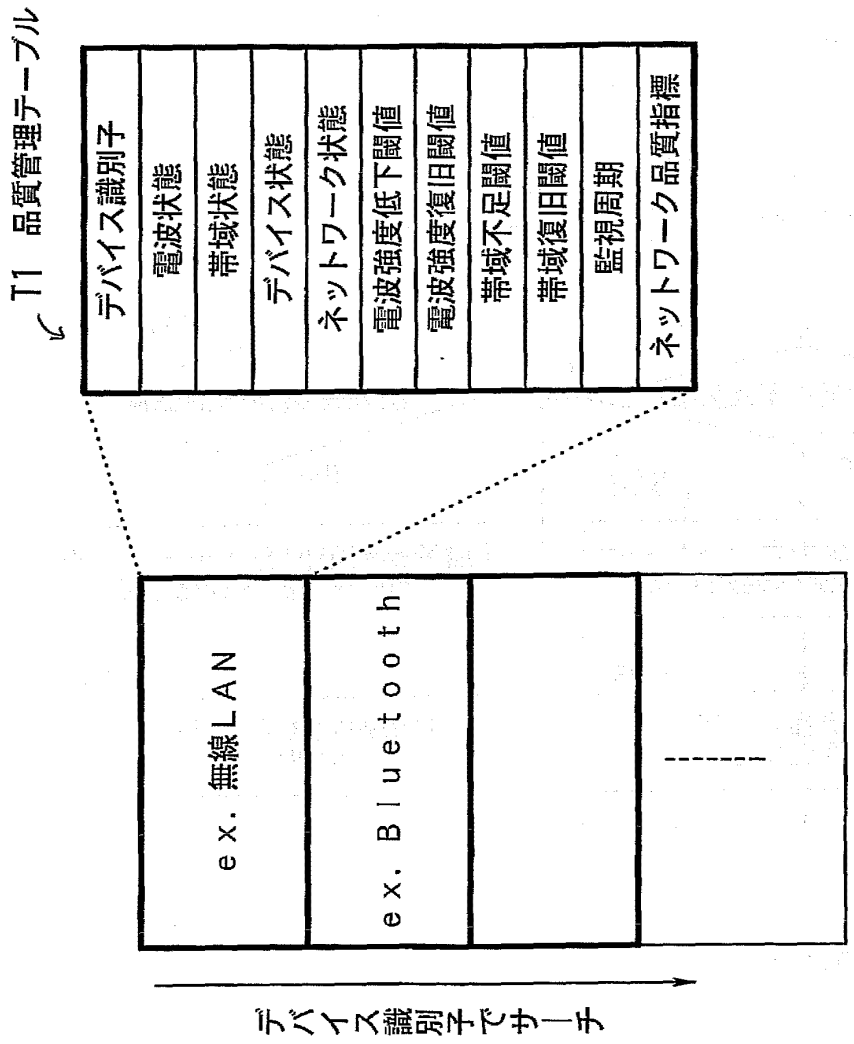

スタート
S51
利用可能な無線帯域を読み出す
S52
無線帯域状態
不足
通常
S53
無線帯域＜不足閾値
NO
YES
S54
無線帯域不足をネットワーク状態管理部へ通知する
S55
無線帯域状態を「不足」に設定する
S56
無線帯域＞復旧閾値
NO
YES
S57
無線帯域復旧をネットワーク状態管理部へ通知する
S58
無線帯域状態を「通常」に設定する
エンド

図１０


T1 品質管理テーブル
デバイス識別子
電波状態
帯域状態
デバイス状態
ネットワーク状態
電波強度低下閾値
電波強度復旧閾値
帯域不足閾値
帯域復旧閾値
監視周期
ネットワーク品質指標
ex. 無線LAN
ex. Bluetooth

デバイス識別子データ

図11

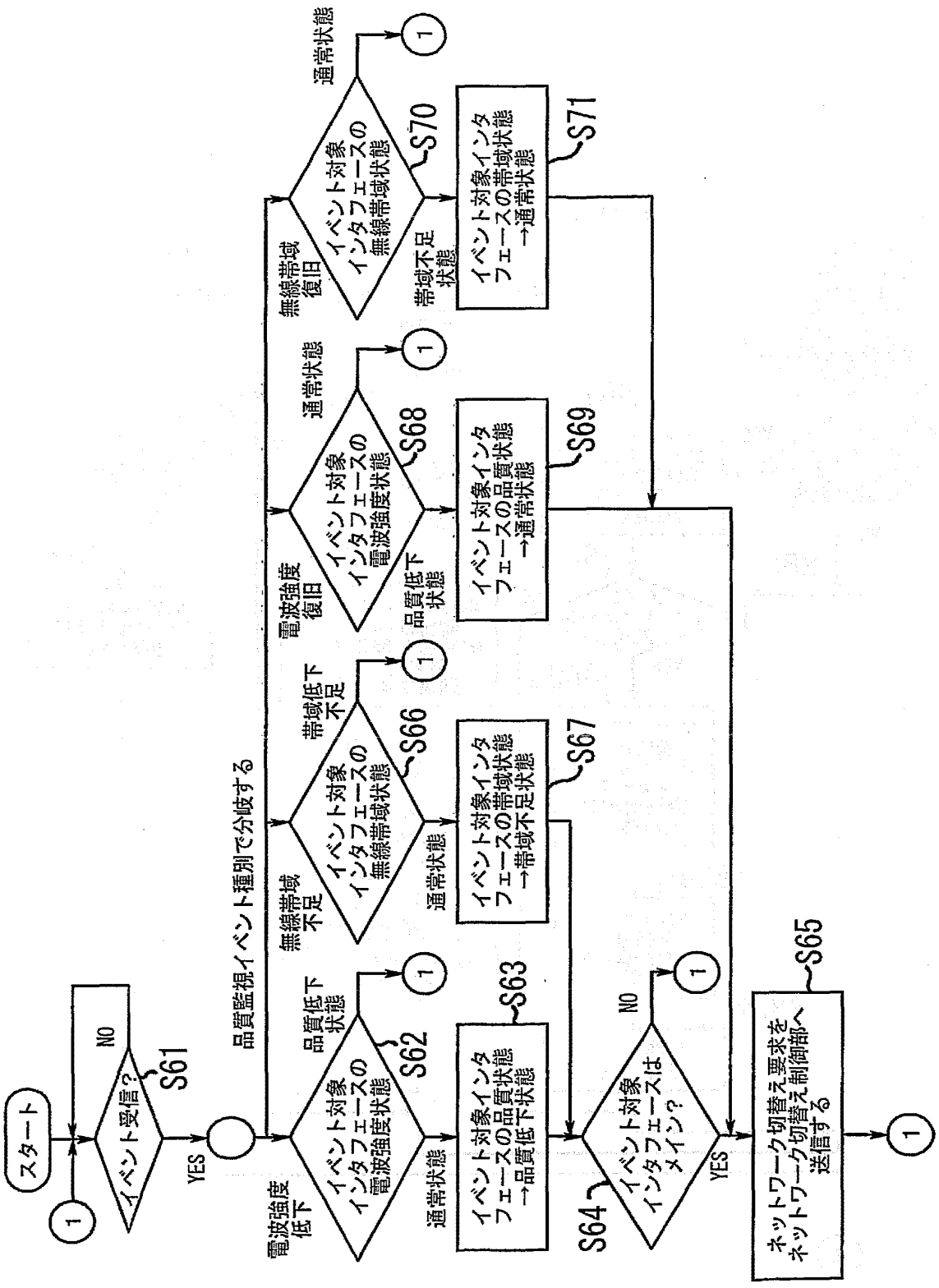

スタート
イベント受信?
S61
NO
YES
品質監視イベント種別で分岐する
電波強度低下
イベント対象インタフェースの電波強度状態
S62
品質低下状態
通常状態
イベント対象インタフェースの品質状態→品質低下状態
S63
無線帯域不足
イベント対象インタフェースの無線帯域状態
S66
帯域低下不足
通常状態
イベント対象インタフェースの帯域状態→帯域不足状態
S67
電波強度復旧
イベント対象インタフェースの電波強度状態
S68
通常状態
品質低下状態
イベント対象インタフェースの品質状態→通常状態
S69
無線帯域復旧
イベント対象インタフェースの無線帯域状態
S70
通常状態
帯域不足状態
イベント対象インタフェースの帯域状態→通常状態
S71
イベント対象インタフェースはメイン?
S64
NO
YES
ネットワーク切替え要求をネットワーク切替え制御部へ送信する
S65
1

図12

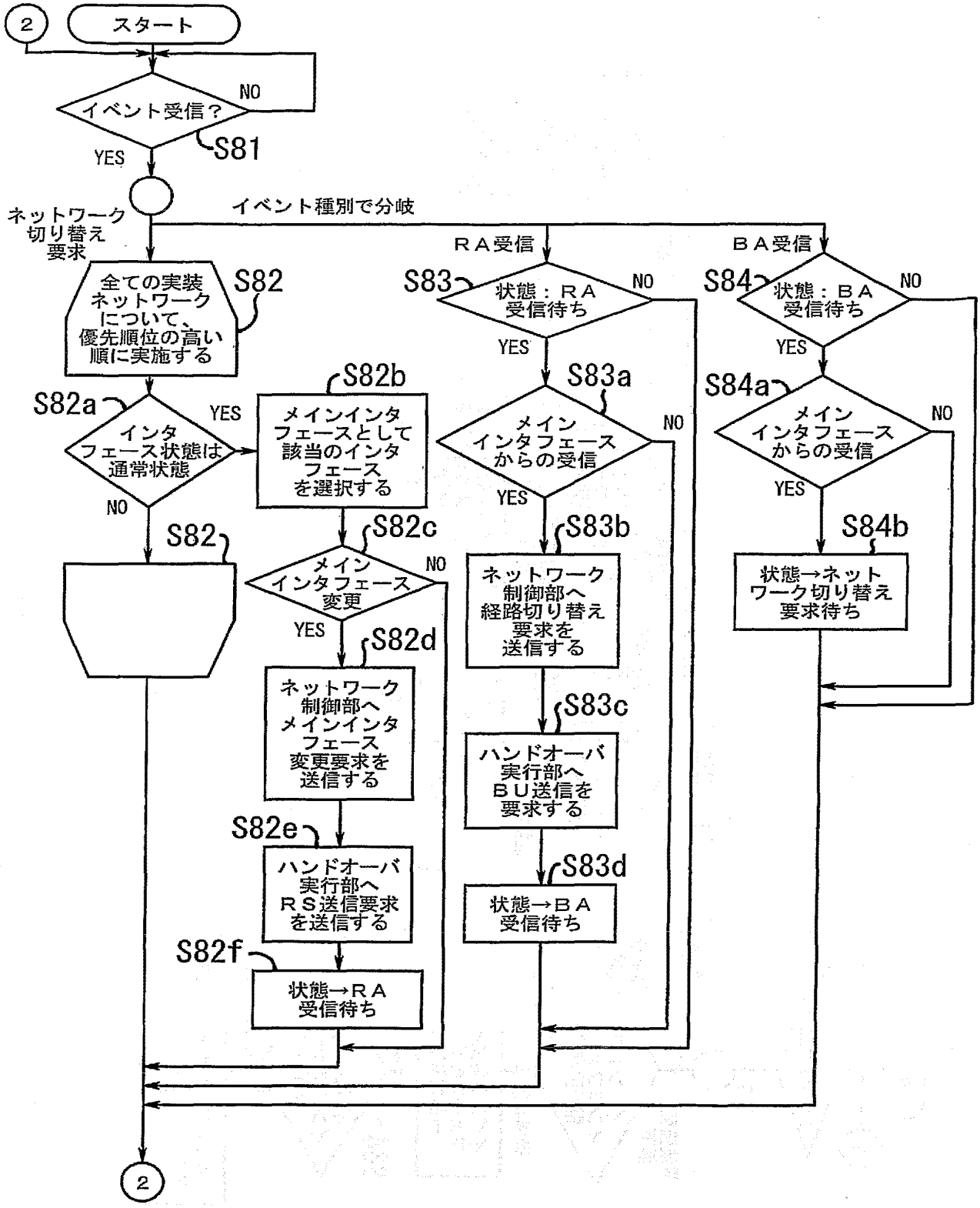


図１３

差替え用紙（規則26）

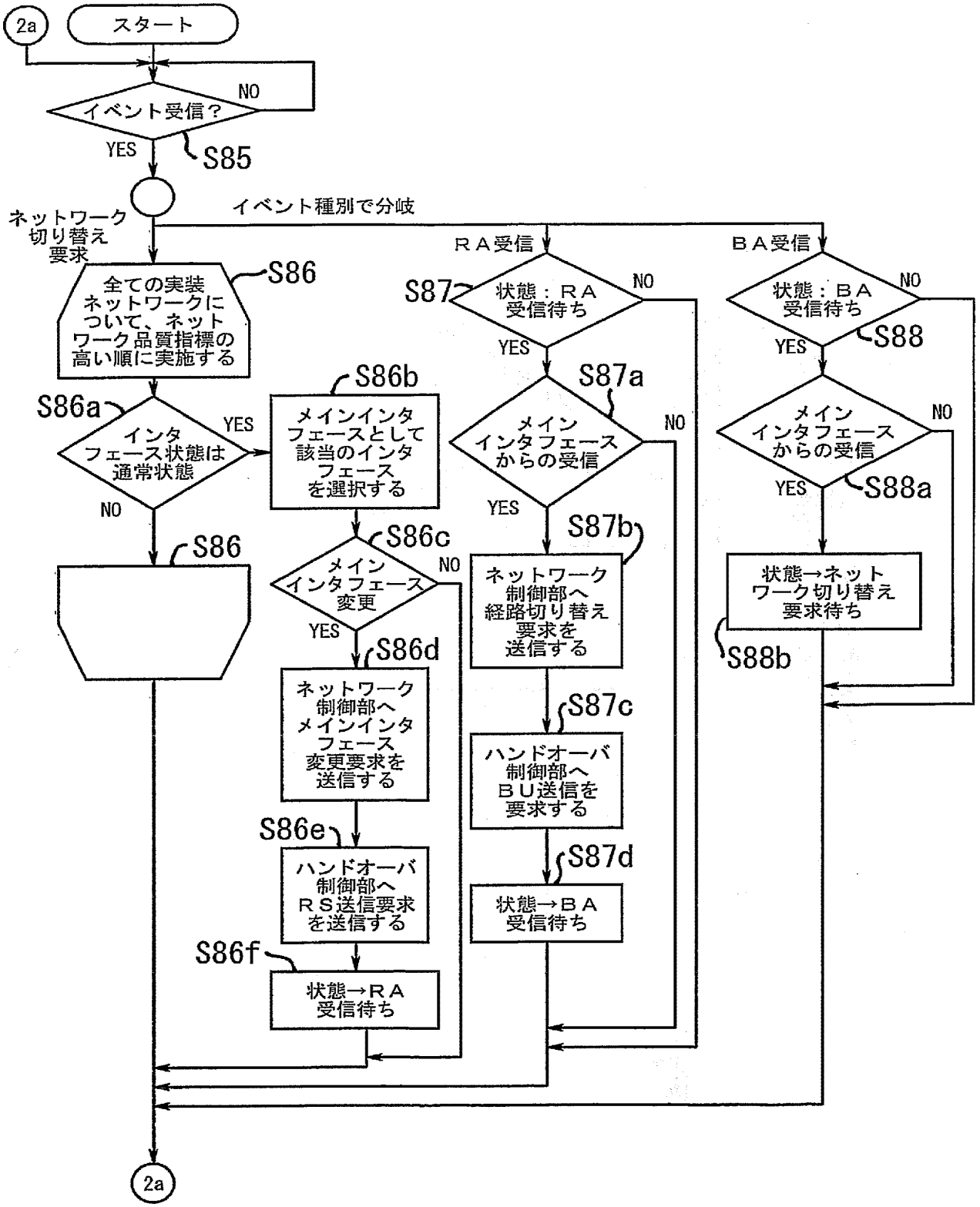

2a
スタート
NO
イベント受信？
YES
S85
ネットワーク
切り替え
要求
イベント種別で分岐
ＲＡ受信
ＢＡ受信
全ての実装
ネットワークに
ついて、ネット
ワーク品質指標の
高い順に実施する
S86
S86a
インタ
フェース状態は
通常状態
YES
NO
S86b
メインインタ
フェースとして
該当のインタ
フェース
を選択する
S86c
メイン
インタフェース
変更
NO
YES
S86d
ネットワーク
制御部へ
メインインタ
フェース
変更要求を
送信する
S86e
ハンドオーバ
制御部へ
ＲＳ送信要求
を送信する
S86f
状態→ＲＡ
受信待ち
S87
状態：ＲＡ
受信待ち
NO
YES
S87a
メイン
インタフェース
からの受信
NO
YES
S87b
ネットワーク
制御部へ
経路切り替え
要求を
送信する
S87c
ハンドオーバ
制御部へ
ＢＵ送信を
要求する
S87d
状態→ＢＡ
受信待ち
状態：ＢＡ
受信待ち
NO
YES
S88
メイン
インタフェース
からの受信
NO
YES
S88a
状態→ネット
ワーク切り替え
要求待ち
S88b
2a

図１４

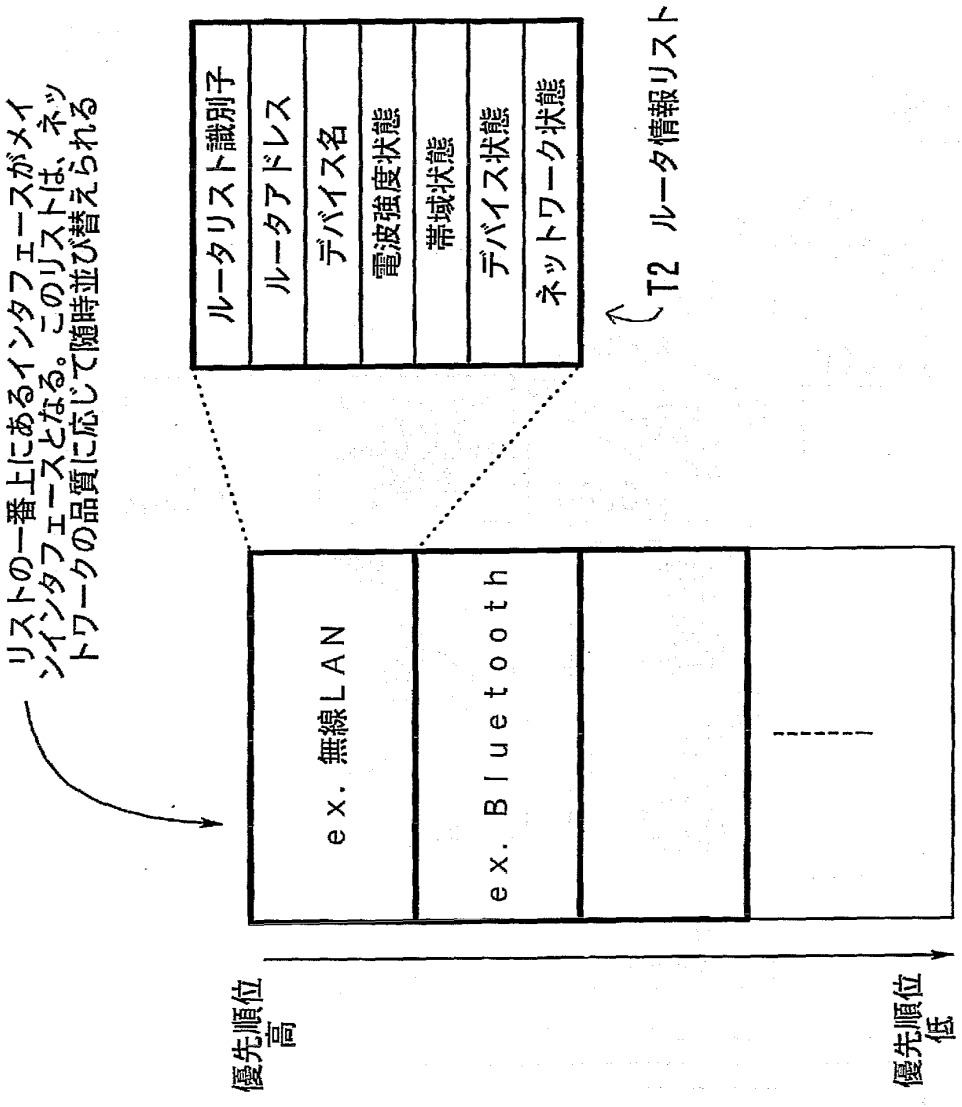

リストの一番上にあるインタフェースがメインインタフェースとなる。このリストは、ネットワークの品質に応じて随時並び替えられる
ルータリスト識別子
ルータアドレス
デバイス名
電波強度状態
帯域状態
デバイス状態
ネットワーク状態
T2 ルータ情報リスト
ex. 無線LAN
ex. Bluetooth
優先順位高
優先順位低

図15

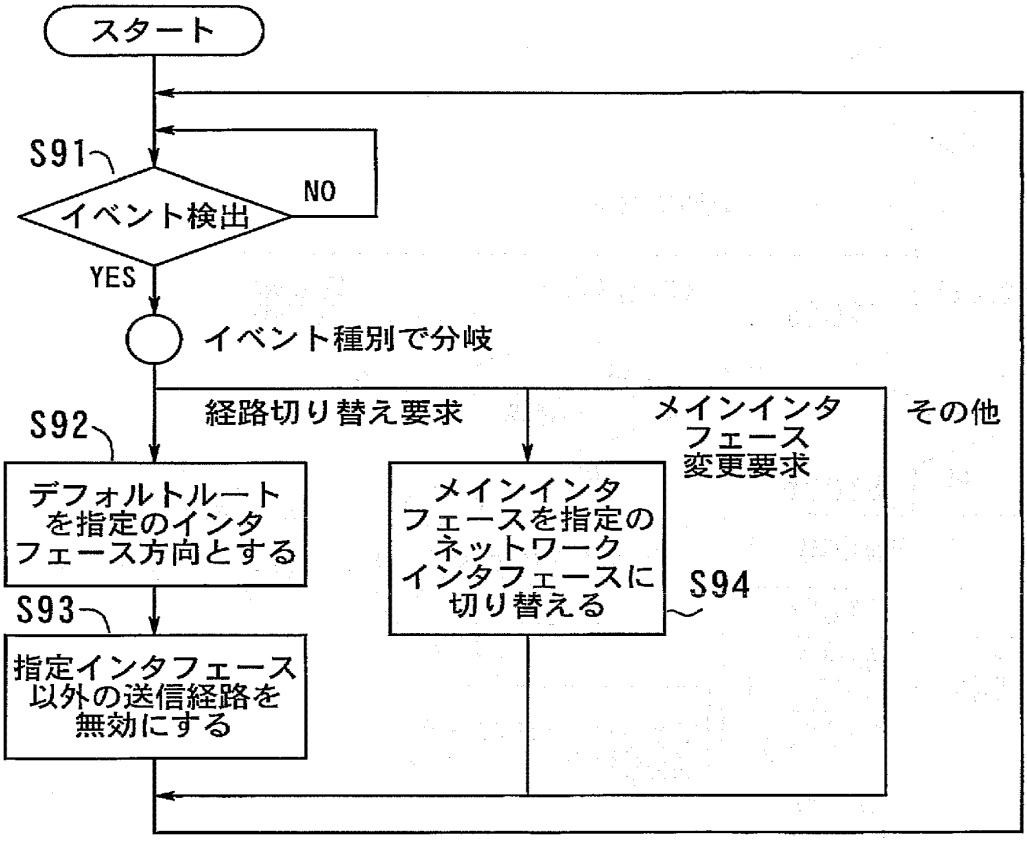

スタート
S91
イベント検出
NO
YES
イベント種別で分岐
経路切り替え要求
メインインタフェース変更要求
その他
S92
デフォルトルートを指定のインタフェース方向とする
S93
指定インタフェース以外の送信経路を無効にする
メインインタフェースを指定のネットワークインタフェースに切り替える
S94

図１６

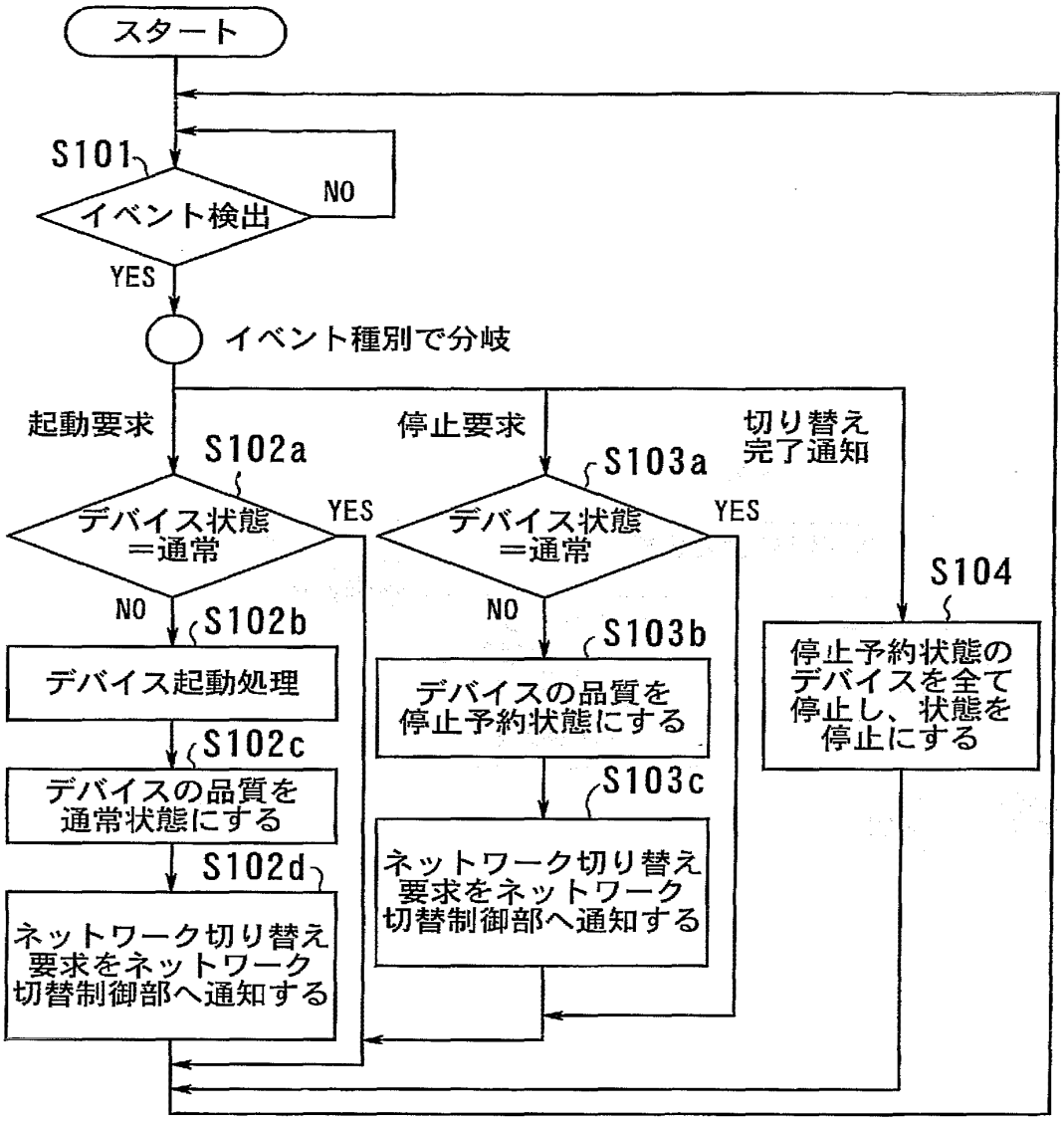

スタート
S101
イベント検出
NO
YES
イベント種別で分岐
起動要求
停止要求
切り替え
完了通知
S102a
デバイス状態
＝通常
YES
NO
S102b
デバイス起動処理
S102c
デバイスの品質を
通常状態にする
S102d
ネットワーク切り替え
要求をネットワーク
切替制御部へ通知する
S103a
デバイス状態
＝通常
YES
NO
S103b
デバイスの品質を
停止予約状態にする
S103c
ネットワーク切り替え
要求をネットワーク
切替制御部へ通知する
S104
停止予約状態の
デバイスを全て
停止し、状態を
停止にする

図１７

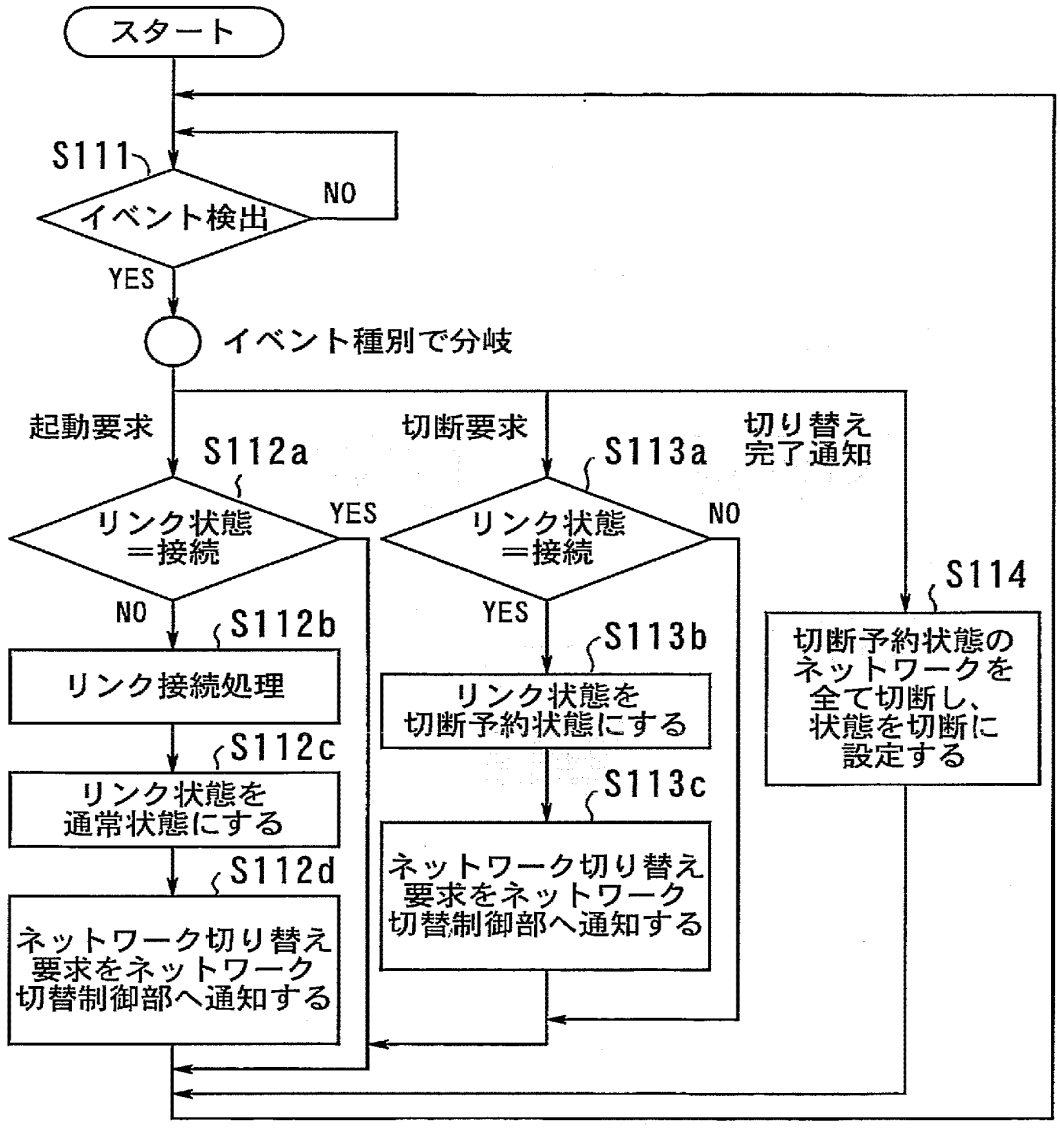

スタート
S111
イベント検出
NO
YES
イベント種別で分岐
起動要求
切断要求
切り替え
完了通知
S112a
リンク状態
＝接続
YES
NO
S112b
リンク接続処理
S112c
リンク状態を
通常状態にする
S112d
ネットワーク切り替え
要求をネットワーク
切替制御部へ通知する
S113a
リンク状態
＝接続
NO
YES
S113b
リンク状態を
切断予約状態にする
S113c
ネットワーク切り替え
要求をネットワーク
切替制御部へ通知する
S114
切断予約状態の
ネットワークを
全て切断し、
状態を切断に
設定する

図１８

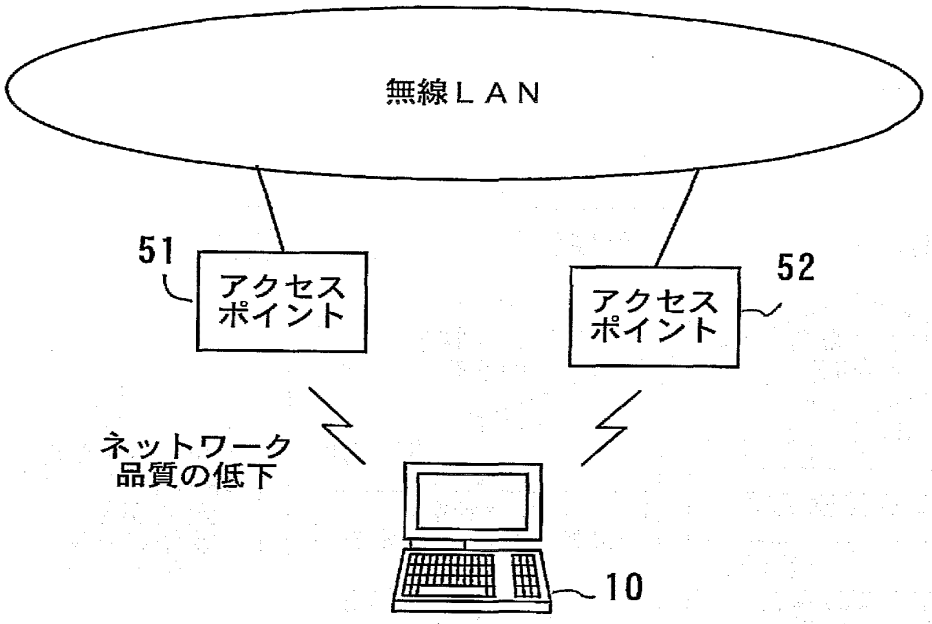


図１９

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/13331

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] H04Q7/38, H04L12/28, H04L12/46, H04L12/56

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] H04Q7/00-7/38, H04L12/28, H04L12/46, H04L12/56

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho	1922-1996	Toroku Jitsuyo Shinan Koho	1994-2003
Kokai Jitsuyo Shinan Koho	1971-2003	Jitsuyo Shinan Toroku Koho	1996-2003

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2000-115236 A (Oki Electric Industry Co., Ltd.), 21 April, 2000 (21.04.00), Abstract; Claims (Family: none)	1-28
Y	JP 2002-125254 A (Mitsubishi Electric Corp.), 26 April, 2002 (26.04.02), Par. No. [0008] & EP 1199841 A2 & US 2002/0045450 A1	1-28
Y	JP 6-45990 A (Oki Electric Industry Co., Ltd.), 18 February, 1994 (18.02.94), Abstract (Family: none)	1-28

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier document but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
01 April, 2003 (01.04.03)	22 April, 2003 (22.04.03)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP02/13331

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 10-126830 A (Matsushita Electric Industrial Co., Ltd.), 15 May, 1998 (15.05.98), Abstract & EP 837617 A2 & CN 1183014 A & KR 259907 A & US 6233454 B1	1-28
A	JP 2001-258058 A (NTT Docomo Inc.), 21 September, 2001 (21.09.01), Par. Nos. [0052] to [0058] (Family: none)	1-28

国際調査報告	国際出願番号　ＰＣＴ／ＪＰ０２／１３３３１

A.　発明の属する分野の分類（国際特許分類（ＩＰＣ））
Ｉｎｔ．Ｃｌ⁷　Ｈ０４Ｑ７／３８
Ｉｎｔ．Ｃｌ⁷　Ｈ０４Ｌ１２／２８，　Ｈ０４Ｌ１２／４６，　Ｈ０４Ｌ１２／５６

B.　調査を行った分野
調査を行った最小限資料（国際特許分類（ＩＰＣ））
Ｉｎｔ．Ｃｌ⁷　Ｈ０４Ｑ７／００－７／３８
Ｉｎｔ．Ｃｌ⁷　Ｈ０４Ｌ１２／２８，　Ｈ０４Ｌ１２／４６，　Ｈ０４Ｌ１２／５６

最小限資料以外の資料で調査を行った分野に含まれるもの
日本国実用新案公報　　１９２２－１９９６年
日本国公開実用新案公報　　１９７１－２００３年
日本国登録実用新案公報　　１９９４－２００３年
日本国実用新案登録公報　　１９９６－２００３年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

C.　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
Ｙ	ＪＰ　２０００－１１５２３６　Ａ（沖電気工業株式会社）２０００．０４．２１，要約、特許請求の範囲（ファミリーなし）	1-28
Ｙ	ＪＰ　２００２－１２５２５４　Ａ（三菱電機株式会社）２００２．０４．２６，第８段落 ＆　ＥＰ　１１９９８４１　Ａ２ ＆　ＵＳ　２００２／００４５４５０　Ａ１	1-28

☒　Ｃ欄の続きにも文献が列挙されている。　　☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日	国際調査報告の発送日
０１．０４．０３	22.04.03

国際調査機関の名称及びあて先	特許庁審査官（権限のある職員）	
日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	青木　健	５Ｊ　９５７１
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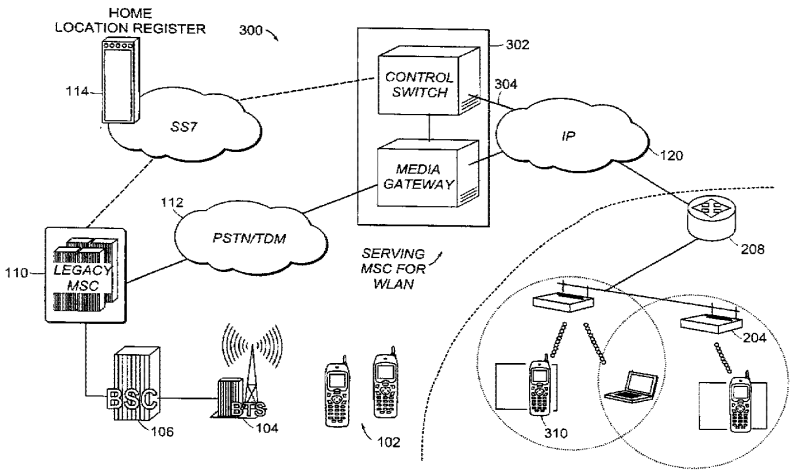
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(54) Title: METHOD, SYSTEM AND APPARATUS FOR PROVIDING WWAN SERVICES TO A MOBILE STATION SERVICED BY A WLAN



(57) Abstract: A method, system and apparatus for internetworking a WWAN and a WLAN are disclosed. More specifically, a method, system and appparatus for providing WWAN services to a mobile station serviced by a WLAN are disclosed. An MSC is provisioned to provide a WLAN service. The MSC forms SIP messages using the received WWAN mesages and delivers the SIP messages to the WLAN via an IP link. The WLAN delivers the SIP messages to the mobile station via a WLAN air interface protocol. Under one embodiment, the WWAN service is a Short Message Service (SMS). Under another embodiment, the WWAN service is a Message Wait Notification (MWN). Under another embodiment, an MSC that services the WLAN and an MSC servicing the WWAN cooperate to provide TFO call services between a mobile station operating in the WLAN and a mobile station operating in the WWAN.

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Method, System and Apparatus for Providing WWAN Services to a Mobile Station Serviced by a WLAN

Cross Reference to Related Applications

This application claims priority to provisional application no. 60/345,800, entitled "Method for Voice Internetworking Between Local Area and Wide Area Mobile Wireless Networks," filed on January 2, 2002.

Background of the Invention

1. Field of the Invention

This invention relates to internetworking between wireless local area networks (WLANs) and wide area mobile wireless networks.

2. Discussion of Related Art

Subscribers are adopting wireless telephony in increasingly large numbers. This trend is being fueled further by attractive rate plans that are bringing the cost of telephony to acceptable levels for people in most walks of society. It is more common for people to rely almost exclusively on a mobile telephone for their telephony needs. In an office or enterprise environment, however, mobile telephony has not surpassed wireline enterprise telephony for a number of reasons, salient amongst which are the following:

- The weakness of R/F signals from the wide area network infrastructure within an office building, leading to problems in mobility management and voice quality.
- The availability of special PBX features in office telephony systems, such as abbreviated dialing, offer a strong incentive for the continued use of enterprise telephony solutions.

The situation at the present is that people employ two distinct telephony systems, one in the wireless wide area network, and another in the enterprise premises that is a wireline telephony system, leading to a plurality of handsets, voice mailboxes and addressing mechanisms.

Parallel to these developments, wireless local area networks are becoming increasingly popular for wireless data applications. In such networks, reasonable bandwidth is available to enterprise-wide wireless clients, e.g., in 802.11b WLAN

networks up to 11Mbps are available to a wireless client. This bandwidth is more than sufficient to carry voice as well. Moreover, widespread use of WLAN technology is driving down the price of the technology.

Figure 1 shows an exemplary wireless wide area network (WWAN) 100 (also known as a wide area mobile wireless network). WWAN 100 includes a plurality of remote units (handsets) 102 in radio contact with one or more antennae based systems called Base Transceiver System (BTS) 104 that transceive the radio signals to/from the handsets. A plurality of BTS communicate with a controller called the Base Station Controller (BSC) 106 via fixed links 108 using a variety of protocols and techniques, such as TDM, IP etc. A plurality of BSC communicate with a switch called the mobile switching center (MSC) 110 that provides connectivity to a wide area switched telephone network (WSTN) 111. The WSTN includes signaling links 113, such as SS7 links, and the public switched telephone network (PSTN) 112. As illustrated by MSC 115, an MSC may include a control plane 117 for handling messages on the signaling links, which may be communicated according to a variety of protocols, such as IOS, GSM A interface, IS 41, GSM MAP, etc. The MSC 115 may also include a media gateway 119 that cooperates with the control plane for handling the bearer circuits of the PSTN 112. Some modern MSCs, such as MSC 115, may also communicate on IP networks, such as IP network 120.

An MSC with its associated BSC and BTS collectively define a coverage area in which handsets are allowed to receive or transmit telephone calls. Incoming calls to a mobile handset arrive from the PSTN to a gateway MSC, e.g., 115, that then routes the call to the MSC 110, called a serving MSC, within whose coverage area the receiving handset is currently roaming. Outgoing calls from a handset are routed to the serving MSC 109 of the originating handset from where the call is either routed to the serving MSC of the receiving mobile handset via the gateway MSC or to the WSTN via the gateway MSC from where the WSTN routes the call to a (wireline) handset.

In some arrangements, the gateway and serving MSC functions may be implemented by the same physical entities. Subscribers are allowed to roam in the coverage area and while roaming the various entities of the WWAN cooperate to ensure that the wireless connectivity of the handset is preserved under roaming. A handset may roam from the coverage area of one set of BTS/BSC/MSC to the coverage area of another

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set of BTS/BSC/MSC. The former set of BTS/BSC/MSC is called the source and the latter set is called the target entities. A set of procedures has been defined that mediate the handoff of the handset from the source to the target entities of the WWAN. As a consequence of the handoff procedures, an update of the location of the handset may occur. This is accomplished by the handset sending a location update message to an MSC that routes the message to a registry called the Home Location Register (HLR) 114 using standard industry protocols such as IS-41, GSM-MAP, etc.

Various air interface technologies are used for the communication between handsets 102 and BTS 104. These technologies include code division multiple access (CDMA), global system for mobile communications (GSM), Personal Digital cellular (PDC), etc., and various extensions and enhancements of these technologies such as CDMA2000, universal mobile terrestrial system (UMTS), international mobile telephone IMT-2000, etc. All such networks employ the above referenced entities in well known, albeit using different nomenclature, configurations to transceive telephone calls. All this is well known to practitioners with ordinary skill in the art.

Figure 2 illustrates an exemplary wireless local area network (WLAN) 200. WLAN includes one or more geographical areas (cells) called basic service set (BSS) 202. A cell is controlled by a system called an access point (AP) 204. Typically, a WLAN includes several BSS, each with its associated AP. The AP are interconnected usually with a wireline network 206 typically using Ethernet in 802.x WLAN technologies. The AP communicate with an enterprise router 208 that typically routes traffic within and out of an enterprise network. Wireless data clients 210 are allowed to roam within a defined BSS and across the defined BSS, with handoff of the client from one AP to the adjoining AP in accordance to known procedures. In typical WLAN implementations, the physical layer uses variety of technologies, e.g., in 802.11 WLAN implementations the physical layer may use infrared, frequency hopping spread spectrum in the 2.4GHz Band, or direct sequence spread spectrum in the 2.4GHz Band. The medium access layer (MAC) in addition to carrying out typical functions performs additional functions such as packet fragmentation, re-transmission and acknowledgements.

The MAC layer supports two basic access mechanisms: the distributed coordination function (DCF) and the point coordination function (PCF). In DCF the basic

access mechanism is a carrier sense multiple access with collision avoidance (CSMA/CA) mechanism. A typical example is Ethernet that is a CSMA with collision detection (CD) mechanism. In CSMA protocols a client wishing to transmit senses the medium, and if the medium is found to be busy, i.e., is being used by some other client, defers the transmission; otherwise it is allowed to transmit. There is always a possibility that two clients will sense the medium to be free and start transmissions thus resulting in collisions; therefore, collision avoidance and detection is very important in such protocols. For example, the 802.11 WLAN uses collision avoidance and detection mechanisms. An 802.11 client wishing to transmit senses the medium and if found busy defers the transmission; otherwise, it transmits. The receiver checks the receipt of a proper transmission (via the cyclical redundancy check –CRC) and if found satisfactory, sends back an acknowledgement. Receipt of the acknowledgement will indicate to the transmitter that the transmission was received properly. If no acknowledgement is received, the transmitter will re-transmit until an acknowledgement is received or the transmitter decides to abort the transmission. In order to further reduce the possibility of collisions certain implementations also use the virtual carrier sense mechanism. In this scheme, a client wishing to transmit, first signals its intent by sending a request to send (RTS) to the intended receiver. The receiver responds with a clear to send (CTS) that effectively "reserves" the medium for the transmitter and receiver. The transmitter may now transmit the intended information.

In those cases when a client wishing to transmit finds the medium busy, the client defers the transmission. The client is thus obliged to re-try to find the status of the medium. In standard approaches to this problem, an "exponential back off procedure" is used to determine the frequency of re-trials. The method involves the choice of a random number and awaiting that many time slots before a re-trial. If a re-try finds the medium busy again, the re-trial number is reduced exponentially. This back off procedure is also used after a successful transmission and after each re-transmission.

When a client wishes to access a BSS (either after a power up or when first entering the BSS) it needs to get synchronization information from the AP controlling the BSS. Two methods have been defined for clients to get this information. In the passive scanning method the client waits to receive a "beacon frame" from the AP that is transmitted by the AP at regular intervals. The beacon frame contains the synchronization

information. In the second method, called active scanning, the client sends a probe to the AP and awaits a response to the probe. Once the station finds an AP, it needs to be authenticated. This requires exchange of information between the AP and the client to establish the authenticity of the client. Once the authentication process is completed, the client starts the association process that involves exchange of information between the client and the APs about the location of the client and the capabilities of the BSS. At the completion of the association process, the client is ready for receiving or transmitting data.

In the PCF access mechanism, the AP gains control of the medium upon sensing it to be free for a given length of time called the point inter frame space (PIFS). The AP then assumes the role of the coordinator and starts to poll all stations enumerated on a "poll list" maintained by the AP. When polled, a station is allowed to transmit. The period in which the AP supports PCF mode is contention-free so may provide better opportunities for voice traffic. The AP must alternate the DCF and PCF periods. All this is well known to practitioners with ordinary skill in the art.

Therefore, what is needed is a method for internetworking of WLAN and Wireless Wide Area Networks (WWAN) for voice communications with full mobility management across the two networks and the preservation of PBX features in the WWAN environment.

Summary

The invention provides a method, system, and apparatus for a Mobile Station to Sense and Select a Wireless Local Area Network (WLAN) or a Wide Area Mobile Wireless Network (WWAN). Among other things, this facilitates the internetworking of WLANs and WWANs and facilitates the use of multimode mobile stations that can selectively communicate with either a WLAN or a WWAN.

According to one aspect of the invention, a mobile station may communicate according to an 802.xx wireless local area network air interface protocol via WLAN logic or according to a wireless wide area network air interface protocol via WWAN logic. The mobile station detects RF energy in the 802.xx spectrum and, in response to the energy detection, determines whether there is an 802.xx WLAN capable of servicing the mobile station by performing a scanning operation. If there is an 802.xx WLAN capable

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of servicing the mobile station, the mobile station selects the WLAN logic so that it may communicate via an air interface.

According to another aspect of the invention, the WWAN has information identifying the areas in which capable WLANs operate and the WWAN provisions the mobile station with at least a subset of such information. The mobile station uses such area-identifying information to determine whether to perform the RF energy detection operation.

According to another aspect of the invention, the area-identifying information is cell ids and the mobile station compares the cell id information in which it is operating with the provisioned cell ids.

According to another aspect of the invention, the area-identifying information is geographical positioning satellite (GPS) information and the mobile station determines its GPS coordinates and compares it against the provisioned GPS information.

According to another aspect of the invention, the mobile station compares the RF energy value with a threshold value and the mobile station detects the RF energy of the WWAN and compares said RF energy of the WWAN with a predetermined value. The comparisons of the RF energy values with corresponding thresholds are used by the mobile station to select whether to communicate with the 802.xx WLAN and the WWAN.

According to another aspect of the invention, the area-identifying information includes information identifying WLANs other than that used by a service plan of the mobile station.

According to another aspect of the invention, the information identifying WLANs includes information identifying WLANs of enterprises accepting service of the mobile station.

According to another aspect of the invention, the mobile station is provisioned with the area information via SMS messages from the WWAN.

The invention provides a method, system and apparatus for providing mobility management of a mobile station in WLAN and WWAN environments.

According to one aspect of the invention, a mobile switching center (MSC) is provisioned to act as a serving MSC for a WLAN. A mobile station detects the RF energy of the WLAN and validates its ability to be a member of the WLAN. In response, the mobile station issues a registration request to the serving MSC for the WLAN, and in response, the serving MSC for the WLAN causes a WWAN to recognize that the mobile station is registered with the serving MSC for the WLAN and that the mobile station is no longer served by a prior MSC. The mobile station communicates to entities outside of the WLAN by communicating with the WLAN via a WLAN protocol and the WLAN communicates with the WWAN via the serving MSC for the WLAN.

Under another aspect of the invention, the mobile station issues a registration request by sending a SIP Register message on the WLAN via a WLAN air interface protocol to request registration therein, and the WLAN communicates the registration request to the MSC serving the WLAN.

Under another aspect of the invention, a mobile station detects the RF energy of the WLAN and validates its ability to be a member of the WLAN while the mobile station is participating in a call using a WWAN air interface protocol. In response thereto a message is sent to a source MSC that is servicing the call, indicating that a handoff is desired. The source MSC analyzes the message, establishes itself as an anchor MSC, and establishes communication channels with a target MSC servicing the detected WLAN. The mobile station begins communication with the WLAN via a WLAN air interface. The WLAN forwards messages to the target MSC serving the WLAN via IP communication, and the target MSC relays those communication to the anchor MSC.

Under another aspect of the invention, a mobile station determines that it should communicate via a WWAN air interface protocol and not via a WLAN air interface protocol. The mobile station issues a registration request to the WWAN via a base station controller (BSC) and MSC corresponding to a location in which the mobile station resides. The corresponding MSC causes the WWAN to recognize that the mobile station is registered with the corresponding MSC and that the mobile station is no longer served

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by a prior MSC which served the mobile station when it was communicating according to a WLAN air interface protocol.

Under another aspect of the invention, a mobile station determines that it should communicate according to a WWAN air interface protocol while the mobile station is participating in a call under a WLAN air interface protocol. In response thereto, a message is sent to a source MSC that is servicing the call indicating that a handoff is desired. The source MSC analyzes the message, establishes itself as an anchor MSC, and establishes communication channels with a target MSC servicing a geographic WWAN area in which the mobile station resides. The mobile station begins communication with the WWAN and the target MSC relays those communication to the anchor MSC.

Under another aspect of the invention, the mobile station informs the MSC serving the WLAN of the cell ids of the WWAN geographic area, and the source MSC uses the cell ids information to establish communication channels with the target MSC.

Under another aspect of the invention, a mobile station determines that it should communicate according to a WWAN air interface protocol while the mobile station is participating in a call under a WLAN air interface protocol. In response thereto a message is sent to a source MSC to request a temporary local directory number (TLDN) . The source MSC provides a TLDN to the mobile station. The source MSC causes a called party of the call to be placed on hold and the mobile station requests a call to be made using the TLDN as a called party. The WWAN causes call connections to be made connecting the mobile station with the TLDN to resume the call.

The invention provides a method, system and apparatus for providing WWAN services to a mobile station serviced by a WLAN.

According to one aspect of the invention, an MSC is provisioned to serve a WLAN. The MSC that serves the WLAN receives WWAN messages that provide a WWAN service. The MSC forms SIP messages using the received WWAN messages and delivers the SIP messages to the WLAN via an IP link. The WLAN delivers the SIP messages to the mobile station via a WLAN air interface protocol.

According to another aspect of the invention, the WWAN service is a Short Message Service (SMS) and the WWAN includes a SMS Center for delivering SMS

messages on the WWAN. The MSC forms SIP Invite messages with SMS payload and delivers said SIP Invite messages to the WLAN.

According to another aspect of the invention, the WWAN service is a Message Wait Notification (MWN) and the WWAN provides MWN messages to the WWAN. The MSC forms SIP Invite messages with MWN information and delivers said SIP Invite messages to the WLAN.

According to another aspect of the invention, the MSC that services the WLAN and an MSC servicing the WWAN cooperate to provide TFO call services between an mobile station operating in the WLAN and a mobile station operating in the WWAN.

Summary

The invention provides a method, system and apparatus for internetworking a mobile station to operate in a WWAN environment and in a WLAN environment with PBX services.

According to one aspect of the invention, a switch is provisioned to communicate with a WLAN via IP communication and to communicate with a PBX via a PBX interface. The switch receives mobile station communications via the WLAN. The switch converts the mobile station communications to a format compatible with the PBX interface and forwards the converted communications to the PBX. The PBX receives and handles the converted communications.

According to another aspect of the invention, the switch is further provisioned to communicate with a WWAN and the switch analyzes the mobile station communications and determines that the communications address an entity external to a domain of the PBX. In response, the switch requests a TLDN from a MSC serving the WWAN. In response to receiving a TLDN from the MSC, the switch sends a message to the PBX to connect the mobile station call to the specified TLDN. The PBX connects the mobile station call to the specified TLDN.

According to another aspect of the invention, a mobile station may roam during the call and switch to an WWAN air interface protocol. The mobile station reconnects to the call by specifying the TLDN of the call.

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According to another aspect of the invention, the reconnection happens automatically without user intervention.

Brief Description of the Drawing

In the Drawing,

Figure 1 shows a prior art wireless wide area network (WWAN);

Figure 2 shows a prior art wireless local area network (WLAN);

Figure 3 shows an internetworked wireless network according to certain embodiments of the invention;

Figure 4 shows a multimode mobile station detecting the presence of a WLAN according to certain embodiments of the invention;

Figure 5 shows a multimode mobile station receiving cell id information from the macro network identifying relevant areas in which the mobile station may sense for a WLAN according to certain embodiments of the invention;

Figure 6 shows a multimode mobile station receiving cell id information from the macro network identifying public and other enterprise WLANs according to certain embodiments of the invention;

Figure 7 shows a multimode mobile station according to certain embodiments of the invention;

Figure 8 shows an internetworked wireless network according to certain embodiments of the invention in which a mobile station may roam from a WLAN environment and/or in which a handoff of servicing a mobile station from a WLAN to a WWAN occurs;

Figure 9 shows mobility management logic according to certain embodiments of the invention;

Figures 10-11 show specific mobility management logic according to certain embodiments of the invention;

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Figure 12 shows mobility management logic according to certain embodiments of the invention;

Figures 13-14 show specific mobility management logic according to certain embodiments of the invention;

Figure 15 shows an internetworked wireless network according to certain embodiments of the invention in which a mobile station may roam from a WWAN environment and/or in which a handoff of servicing a mobile station from a WWAN to a WLAN occurs;

Figure 16 shows mobility management logic according to certain embodiments of the invention;

Figures 17-18 show specific mobility management logic according to certain embodiments of the invention;

Figure 19 shows mobility management logic according to certain embodiments of the invention;

Figures 20-21 show specific mobility management logic according to certain embodiments of the invention;

Figure 22 shows logic for providing SMS to a mobile station operating in a WLAN environment according to certain embodiments of the invention;

Figure 23 shows logic for providing MWN service to a mobile station operating in a WLAN environment according to certain embodiments of the invention;

Figures 24-25 show logic for handling intra enterprise calls according to certain embodiments of the invention;

Figures 26-27 show logic for handling an enterprise to PSTN call according to certain embodiments of the invention;

Figure 28 shows logic for handling an enterprise to macro network call according to certain embodiments of the invention;

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Figure 29 shows an internetworked wireless network according to certain embodiments of the invention;

Figure 30 shows mobility management logic according to certain embodiments of the invention; and

Figure 31 shows an internetworked wireless network according to certain embodiments of the invention in which PBX services are integrated.

Detailed Description

Preferred embodiments of the invention provide voice internetworking between WLANs and WWANs and effectively unify these two disparate technologies. Consequently, users no longer need to suffer the problems associated with multiple handsets, addresses, and voice mailboxes. As will be explained below, under certain embodiments a gateway MSC (GMSC) switch of the WWAN with some associated modifications to the WLAN client provides the logic necessary for unification. In essence the GMSC simultaneously acts as a serving MSC for WLAN voice traffic.

Figure 3 illustrates an exemplary embodiment of the present invention. The WWAN components are like those described above in conjunction with figure 1 except that MSC 302 includes some new internetworking logic discussed below to handle the unification of the WLAN and WWAN to make it act as one macro network 300. Among other things, the MSC 302 acts as a serving MSC for the WLAN. The WLAN and WWAN are now effectively connected by the IP links 304. Voice traffic along with the associated signaling and control messages to and from the WLAN are carried on the set of IP links 304 from the enterprise to the IP interfaces of the MSC 302. The WLAN components are also like those described above, except that the handsets or wireless data clients 310 now include multimode devices capable of operating in the WLAN or WWAN environments, as will be explained below.

The MSC 302 allows telephone calls to be completed between clients of the WWAN 100 and WLAN 200. The WLAN clients are free to roam in the WLAN environment and may also roam in the WWAN environment without any manual interventions required of the subscriber. The voice traffic from the WLAN to the MSC 302 may utilize any of the known voice coding technologies. For CDMA networks the

Enhanced Variable Rate Codec (EVRC) may be used and for GSM networks Adaptive Multi-rate (AMR) coding could be used. The coded voice is then carried as RTP/UDP/IP packets on the IP links 304. The control and signaling information is also carried on the IP links 304 from the WLAN 200 to the MSC 302. In certain embodiments the control and signaling information is carried in the format of Session Initiation Protocol (SIP) messages with additional information elements (IEs) described as a part of the present invention for control of hand offs of the handsets.

Voice internetworking in certain embodiments is facilitated by the use of a multimode handset 310 that may operate in a WLAN or WWAN environment. The WLAN and WWAN (multimode) phone 310 at any time should be able to automatically determine if it is capable of using WLAN access instead of a macro network carrier (GSM, CDMA, UMTS, TDMA, PDC, etc.).

The presence of a WLAN can be inferred by detecting RF energy in the permitted 802.11b/a spectrum (2.4GHz band for 802.11b/802.11g and 5 GHz band for 802.11a). As shown in Figure 4, the mobile station 310 may initiate a detection 402 of RF energy in the relevant spectrum. After successful energy detection, the mobile station can detect if a valid WLAN 200 is present by one of the two methods:

- Passive Scanning: the station 310 searches for a beacon frame broadcast by the 802.11x AP 204
- Active Scanning: the station 310 transmits probe request frames and waits for probe response frames from the AP 204.

As part of the beacon frame or the probe response, the AP sends a SSID (1-32 octets length string) that identifies the AP 204. The mobile station 310 compares this SSID with a list of SSIDs (which may include ranges) and if there is a match, infers that the WLAN 200 is a valid network for it to gain access. The mobile station 310 goes through an authentication process after a successful SSID match. If the authentication succeeds, the mobile station proceeds with the association process whereby the mobile station joins the WLAN network as a valid and legal client (node).

The mobile station 310 is *a priori* provisioned with the valid list of SSIDs and SSID ranges. The SSID comparison avoids the mobile station from entering into

authentication or association processes in functioning WLAN networks on which it could never be authenticated. For example, let the mobile station MS1 belong to Enterprise E1 that uses SSID En1SSID1. When the mobile station enters the Enterprise E1, the beacon search succeeds and further an SSID match occurs and hence the mobile station proceeds with the authentication process. On successful authentication, it proceeds with the association process and gains access to the WLAN service. When the same mobile station MS1 enters another enterprise that also happens to have a valid 802.11 WLAN but with a different SSID (say, En2SSID2) the SSID does not match the SSID in the mobile and hence the mobile station does not even attempt to initiate authentication (and hence presumes that the WLAN service is not available).

The provisioning of SSIDs in the mobile station can be initiated from the macro network 300 using over the air provisioning procedures (OTASP/OTAPA) in the case of CDMA networks and equivalent in GSM/UMTS networks (using Short Message Service). In order to prevent eavesdropping of the SSIDs in the macro network, the message itself could be encrypted using the same key used in the mobile station for macro network authentication/encryption (A-key or SSD).

The periodic detection and subsequent discovery of the presence of the WLAN impacts the battery life of the mobile station. It is desirable to minimize the battery consumption and one way to achieve this in the multimode phone is to minimize the number of detection or discovery attempts and at the same time preserving the ability to jump on to the enterprise WLAN if it is available. Two observations on the use of the multimode mobile stations 310 enable the reduction in the number of detection/discovery attempts:

- The number of areas where the enterprise Wireless LAN service is available for the subscriber is limited; for example, enterprise subscribers may be limited to get access to their WLAN services in their enterprise locations only.

- The multimode mobile station is always attempting to stay connected to the macro network (CDMA, GSM, UMTS, etc.). For example, a CDMA phone on detection of a valid IS-95/IS-2000 signal will attempt registration with the IS-41 core network; a GSM/UMTS phone on detection of a valid GSM/UMTS signal will attempt registration with the GSM-MAP core network. As a consequence of

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registration, the cell id that is known to both the macro network and the mobile station, indicates the current location of the mobile station.

By relating the above two facts, the macro network 300 can determine when the mobile station 310 should be attempting to detect or discover the enterprise WLAN. As shown in figure 5 in a preferred embodiment of the present invention, the macro network 300 can send 502 information regarding the detection or discovery process to the mobile station 310 on a successful network registration. The information includes the macro network cell-ids where the mobile station 310 should attempt to detect or discover 402' an enterprise WLAN. The cell-id is a gross measure and hence can cover a very large area (in the order of few square miles in rural/suburban areas) or a very small area (in the order of few hundred square meters in dense urban areas).

As an exemplary manifestation of the method of the present invention, consider a CDMA (IS-95) subscriber who is also an enterprise subscriber to 802.11 services in Building W located in Tewksbury, Mass. When the subscriber enters the CDMA switching area in Tewksbury, his IS-95 phone initiates a network registration. As part of this registration, the macro network 300 determines that the subscriber may possibly enter the coverage area of the WLAN service in Building W; that is, the macro network correlates the information that the subscriber and Building W are in the Tewksbury switching area. The macro network now provides 502 the cell-id information where the W building is located to the subscriber's mobile station 310 and a trigger that WLAN sensing should now begin. On receipt of this information, the mobile station starts to scan for the 802.11 beacon, specifically looking for a match with the SSID list of the APs in Building W. This detection will not succeed until the subscriber enters the BSS 202. Upon successful detection of the beacon from the AP 204, the mobile station 310 of the subscriber de-registers from the macro network 300 and registers with the serving MSC 302 for the WLAN 200. When the mobile station 310 roams in the WLAN 200, it continues to sense the RF energy strength of the WWAN 100 and WLAN 200. If it detects that the WLAN RF strength decreases below some threshold value and the WWAN strength is above a threshold value, it initiates a registration process with the macro (WWAN) network 100.

As mentioned before, the cell ids of the macro network 300 may designate very large geographical areas. If the cell id relates to a small geographical area then the

chances of minimizing power consumption in the mobile station are better since the detection or discovery process is limited to the smaller geographical area. Under some embodiments the availability of GPS (Geographical Positioning Satellite) information integrated into the mobile stations may be used. Since GPS information is more accurate as compared to cell id information, the use of GPS information will further reduce the geographical area in which the detection or discovery process needs to be initiated, thus leading to more savings in the power consumption of the mobile station.

The list of cell-ids provided by the macro network to the mobile station can consist not only of enterprise locations that the subscriber can roam into but potentially other "enterprises" or "public areas" as well. For example, the macro network service provider may have a roaming arrangement with a public enterprise LAN such as a restaurant or a hotel. Referring to figure 6, when a subscriber 310 registers with the macro network, it would be beneficial to also receive 602 the cell-ids where the subscriber's enterprise is located but also the cell-ids where the public LANs are located in the same switching area.

The delivery of the location information or more direct instruction to start (or stop) searching for WLAN beacon in the mobile station 310 can be accomplished using standard Short Message Service (SMS), or by using logic based in a Service Control Point (SCP), or by modifying the the HLR or using a Proxy HLR entity. (See, e.g., U.S. Pat. Apl. 09/845,703, filed April 30, 2001 for an example of a proxy HLR, which application is hereby incorporated by reference in its entirety.) When the mobile station 310 registers with the MSC/HLR, the macro network can deliver the cell-id list, beacon search/stop instruction etc., as a SMS (short message service) with a specific type. The SMS message is sent after a successful response to the Location Update initiated by the mobile station 310. The MSC 302 can have switch based logic that initiates a trigger on location update that causes a switch resident or Service Control Point (SCP) resident application to generate the SMS message with the cell-ids. For example, a switch could be programmed to trigger an SCP on receipt of a location update. The SCP-resident logic may then send the location and sensing instructions to the mobile station. Alternatively, the HLR 114 can be modified to perform the same task on successful processing of an IS-41 REGNOT request or GSM-MAP UPDATE LOCATION request. In other embodiments, a Proxy HLR may be employed. The Proxy HLR intercepts all messages

intended for the HLR from the MSC. Registration messages received from the multimode WWAN and WLAN clients are handled by the Proxy HLR whereas messages from all the other clients are forwarded to the HLR without any modifications.

Figure 7 shows a handset 310 according to exemplary embodiments of the present invention. For example, the handsets include logic to communicate according to a WLAN air interface protocol (such as 802.xx) and to communicate according to a WWAN air interface protocol. As described herein, the mobile station may select to use one of the air interface logic unit based on its sensing of relevant radio spectrum. Moreover, a handset may support more than one WWAN macro network technology. For CDMA handsets it is assumed that a WLAN modem will be added to the handset. Additionally, the capability to transport voice as SIP/RTP/UDP/IP packets will be needed. The network sensing method discussed in the previous section along with the modifications required to reduce the detection and discovery traffic by utilizing cell-ids, in the preferred embodiment of the present invention, are to be captured by special computer programs running on the computing platform of the handset.

Figure 8 shows the movement of a mobile station 310 from a WLAN environment 200 to a WWAN environment 100. Under certain embodiments of the invention, the mobile station 310 registers in the WWAN environment 100 as it roams from the WLAN 200 into the WWAN. Likewise the appropriate handoff must be made as well. The mobile station 310, using the network sensing method described above, infers that it needs to register with the WWAN environment.

Mobile Station (MS) leaves WLAN and enters WWAN: Referring to figures 8 and 9, the registration and handoff are implemented in certain embodiments as follows. The logic starts at 900 and proceeds to 902 in which the mobile station 310 issues a registration request to the (new) serving base station controller (BSC) 106 in the WWAN. The BSC 106 transmits 904 a Location Update message to its serving MSC 110. The serving MSC 110 in the WWAN requests 906 a registration from the HLR 114. The HLR 114 sends 908 a de-registration request to the (previous) serving MSC 302 in WLAN. Optionally, the (previous) serving MSC 302 may send 910 a SIP registration cancel request to the mobile station 310 that will respond with a confirmation. This may facilitate "clean up" or "tear down" at the mobile station, since it is no longer communicating via the WLAN. The (previous) serving MSC 302 responds 912 to the de-

registration message to the HLR 114. The HLR confirms 914 the registration request to the (new) serving MSC 110 in the WWAN. The (new) serving MSC 110 accepts 916 the Location Update from the BSC 106. The BSC 106 acknowledges 918 the registration from the mobile station 310.

In an exemplary embodiment of the present invention, if the WWAN is an IS-41 network then the registration, de-registration and confirmatory messages will use IS-41 protocol elements. The various specific messages used, as explained with reference to figure 9, are shown in figure 10. In another exemplary embodiment, if the WWAN is a GSM-MAP network then the registration, de-registration and confirmatory messages will use GSM-MAP protocol elements. The various specific messages used as explained with reference to figure 9 are shown in figure 11.

Hard Handoff from WLAN to WWAN: In this case, the mobile station 310, while engaged in a telephone call, roams from WLAN 200 to WWAN 100. The WLAN environment needs to handoff 802 the mobile station 310 from the WLAN serving MSC 302 to WWAN serving MSC 110. Since the mobile station 310 is engaged in a call within WLAN, the SIP client is managing the call in the mobile station 310. This client needs to inform the WLAN serving MSC 302 the cell ids of the WWAN macro network. In the preferred embodiment of the present invention, the SIP command "SIP INFO" is overloaded with this cell id information. The overloaded information elements are so indicated in the logic described below in connection with figure 12.

The logic starts at 1200 and proceeds to 1202 in which the mobile station 310 informs the WLAN serving MSC (Source MSC) 302 that a handoff is required. This may be based on the network sensing method. As discussed above, in the network sensing method, the mobile station 310 senses both the WLAN and the WWAN networks and chooses one of them based on the relative RF strengths. During the sensing procedure, the cell id of the WWAN network becomes known to the mobile station 310. The mobile station 310 uses the cell id to initiate a hard handoff to the WWAN network from the WLAN network. In the handoff required message the cell id of the WWAN network is sent to the WLAN switch. This is an overloaded SIP command. The cell id is used so that the MSC that was serving the WLAN and is now the anchor knows which other MSC to connect to. The source MSC 302 issues 1204 a facility directive (FD) to the WWAN MSC (Target MSC) 110 that allows it open a bearer channel on PSTN 112 (for example)

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from Source MSC 302 to Target MSC 110. This allows the source MSC to serve as an anchor for the communication, having a new "leg" to the target MSC and an existing pathway to the other entity(ies) on the existing call. The Target MSC 110 sends 1206 a handoff request to the (Target) BSC 106. The Target BSC 106 commences 1208 RF channel signaling with the mobile station 310. The Target BSC 106 sends 1210 handoff request acknowledgement to Target MSC 110. The Target MSC 110 responds 1212 to the facility directive request back to the Source MSC. The Source MSC 302 sends 1214 a message to the mobile station 310 indicating that a handoff may be commenced. For example, this message may be sent as an overloaded SIP message. This message effectively informs the mobile station that it may select and start using the appropriate RF and modulation circuitry to communicate with the WWAN. The mobile station 310 sends 1216 a message to the source MSC 302 to commence handoff. Again, this message may be sent as an overloaded SIP message. The mobile station 310 commences 1218 RF channel signaling with Target BSC 106. The mobile station 310 sends 1220 handoff completion message to Target BSC 106. Again, this message may be sent as an overloaded SIP message. The Target BSC 106 acknowledges 1222 handoff order to the mobile station 310. The Target BSC 106 sends 1224 handoff complete message to Target MSC 110. The Target MSC 110 sends 1226 message to Source MSC 302 indicating that the mobile station 310 is on channel with Target BSC 106. The Source MSC 302 sends 1228 a message to the mobile station 310 indicating that it may clear any resources assigned this transaction. The mobile station 310 responds 1230 with OK acknowledgement.

In an exemplary embodiment of the present invention, if the WWAN is an IS-41 network then the messages, excluding the overloaded messages, will use IS-41 protocol elements. The various specific messages used as explained with reference to figure 12 are shown in figure 13. In another exemplary embodiment, if the WWAN network is a GSM-MAP network, the protocol elements used will be GSM-MAP. The various specific messages used as explained with reference to figure 12 are shown in figure 14.

Figure 15 shows the case of the mobile station 310 roaming from a WWAN 100 to WLAN 200 environment. The mobile station 310, using the network sensing method described above, senses the RF strength in the proximity of the WLAN and decides to start using the WLAN environment, thus initiating a registration request. As outlined

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above, the mobile station may use the cell id information to determine when to start sensing the WLAN.

Mobile Station (MS) enters WLAN from WWAN: As the mobile station 310 enters a WLAN 200 from a WWAN 100, the logic of figure 16 is followed. The logic starts in 1600 and proceeds to 1602 in which the mobile station 310 issues 1602 a registration request to the WLAN Serving MSC 302 upon sensing the WLAN RF energy strength, as described above. This is done via a SIP message (e.g., a broadcast message), which the WLAN Serving MSC receives. The WLAN Serving MSC 302 sends 1604 a registration request to the HLR 114. The HLR issues 1606 a de-registration request to the (previously) Serving WWAN MSC 110. Upon confirmation of de-registration, the HLR sends 1608 a registration response confirmation to the WLAN MSC 302. The WLAN MSC 302 confirms 1610 the registration to the mobile station 310.

In an exemplary embodiment of the present invention, a mobile station 310 roams from IS-41 WWAN to 802.11 WLAN. The various specific messages used as explained with reference to figure 16 are shown in figure 17. In a preferred embodiment of the present invention, the mobile station 310 issues a "SIP Register" message to the WLAN Serving MSC 302 that sends a IS-41 Registration Notification (REGNOT) to the HLR 114. The HLR sends a Registration Cancellation request to the WWAN MSC 110 that was serving the mobile station 310 (to de-register the mobile station) and upon receiving a confirmation of the de-registration, sends a confirmation of registration to the WLAN Serving MSC 302 which then sends a "SIP 200 OK" (confirmation) message back to the mobile station 310, completing the transaction. In another exemplary embodiment of the present invention, if the mobile station 310 enters 802.11 WLAN from GSM-MAP WWAN, the registration, de-registration and confirmation messages from the HLR will employ the corresponding GSM-MAP protocol elements. The various specific messages used as explained with reference to figure 16 are shown in figure 18.

Hard Handoff from WWAN to WLAN: In this case the mobile station 310, while engaged in a telephone call, roams from WWAN 100 to WLAN 200. The unified WLAN and WWAN environment needs to handoff 1502 the mobile station 310 from the WWAN Serving MSC 110 to WLAN Serving MSC 302. Certain embodiments of the invention implement such a handoff using the logic of figure 19.

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The logic begins at 1900 and proceeds to 1902 in which the BSC 106 serving the mobile station 310 (Serving BSC) decides 1902, based upon information received from the mobile station 310 that may be using the Network Sensing Method described above, that a handoff is required. It sends a handoff required message to the Source MSC 110. The Source MSC 110 issues 1904 a facility directive to the WLAN MSC (Target MSC) 302 that allows it to open a bearer channel on PSTN 112 from Source MSC 100 to Target MSC 302. The mobile station 310 sends 1906 a handoff request to the Target MSC 302; under certain embodiments of the present invention, this message is sent using SIP with overloaded commands. The Target MSC 302 acknowledges 1908 the request. The mobile station 310 acknowledges 1910 the response of the Target MSC 302. The Target MSC 302 responds 1912 to facility directive request to Source MSC 110. The Source MSC 110 sends 1914 a message to Source BSC 106 that a handoff may be commenced. The Source BSC 106 sends 1916 a handoff directive to mobile station 310. The mobile station 310 sends 1918 a message to acknowledge. The Source BSC 106 sends 1920 a message to Source MSC 110 that handoff has commenced. The mobile station 310 sends 1922 handoff completion message to Target MSC, again via an overloaded SIP message. The target MSC acknowledges 1924 handoff order to mobile station 310. The Target MSC 302 sends 1926 message to Source MSC 110 indicating that the mobile station 310is on channel with target MSC. The Source MSC 110 sends 1928 a message to Source BSC 106 to clear facilities. The Source BSC 106 responds 1930 with OK clear complete.

In an exemplary embodiment of the present invention, if the WWAN is an IS-41 network then the messages, excluding the overloaded messages, will use IS-41 protocol elements. The various specific messages used as explained with reference to figure 19 are shown in figure 20. In another exemplary embodiment, if the WWAN network is a GSM-MAP network, the protocol elements used will be GSM-MAP. The various specific messages used as explained with reference to figure 19 are shown in figure 21.

Delivery of Short Message Service (SMS) in WLAN: SMS is a service that is typically supported in the WWAN 100 by a network entity known as the Short Messaging Service Center (SMSC). A mobile station 310 while roaming in a WLAN 200 preferably supports SMS service. Under certain embodiments the logic of figure 22 implements the SMS service in WLAN 200.

The SMS Messaging Center sends 2202 a SMS request (Short Message Delivery Point to Point –SMDPP) to the WLAN Serving MSC 302. In certain embodiments of the present invention the Serving MSC 302 overloads and sends 2204 the SIP INVITE message with SMS payload to the mobile station 310. The mobile station 310 responds 2206 with an OK acknowledgement. Serving MSC 302 indicates 2208 to the MS that the transaction is complete. The mobile station 310 responds 2210 OK. The Serving MSC 302 responds 2212 with SMDPP Request Response to the SMS Message Center.

Delivery of IS-41 Message Wait Notification (MWN) in WLAN: MWN is a feature of WWAN 100. A mobile station 310 while roaming in WLAN 200 preferably supports MWN service. Under certain embodiments the logic of figure 23 provides MWN in WLAN.

The IS-41 HLR 114 sends 2302 a Qualification Directory Notification (with MWN Type) to the WLAN Serving MSC 302. In certain embodiments of the present invention the Serving MSC 302 overloads 2304 the SIP INVITE message with MWN info to the mobile station 310. The mobile station 310 responds 2306 with an OK acknowledgement. The Serving MSC 302 indicates 2308 to the mobile station 310 that the transaction is complete. The mobile station 310 responds 2310 OK. The Serving MSC 302 responds 2312 with Qualification Directive Notification Response Request to the IS-41 HLR.

Intra Enterprise Telephone Call: In this case a mobile station 310 (MS1) while roaming in the WLAN 200 initiates an intra enterprise call to another mobile station (MS2). Under certain embodiments, all interactions with MS1 and MS2 are carried out in SIP. The logic to implement such calls is described in connection with figure 24.

MS1 initiates 2402 a call request to the WLAN Serving MSC 302. The MSC 302 receives the request and asks 2404 the HLR 114 to locate MS2. HLR 114 responds 2406 with location of MS2. The MSC 302 issues 2408 an invitation to MS2. MS2 acknowledges 2410 request. The MSC 302 acknowledges 2412 the acknowledgement of MS2. The MSC 302 sends 2414 acknowledgement to MS1 indicating that the call may now proceed. MS1 acks 2416, and the call between MS1 and MS2 proceeds.

In an exemplary embodiment of the present invention, the intra enterprise call proceeds using EVRC (Extended Variable Rate Coding) on RTP/UDP/IP packets. The

requests to locate MS2 in IS-41 networks may use IS-41 protocol elements. Figure 25 shows another exemplary embodiment in which the call proceeds by using GSM EFR (Extended Full Rate Coding) on RTP/UDP/IP packets with HLR inquiries using GSM-MAP protocol elements.

Enterprise to PSTN Telephone Call: In this case a mobile station 310 initiates a telephone call to a PSTN handset. The logic of certain embodiments of the invention to support such a call is described in connection with figure 26.

The mobile station 310 using SIP sends 2602 a call request to the Serving WLAN MSC 302. The Serving MSC 302 asks 2604 the HLR 114 to locate the called party. The HLR 114 responds 2606 with the location (PSTN switch) of the called party. The Serving MSC 302 requests 2608 a connection capable of carrying voice traffic from the Media Gateway of the MSC 302. The Media Gateway responds 2610 with a connection response. The Serving MSC 302 sends 2612 a connection request to the PSTN switch associated with the called telephone number (i.e., the switch to which the called party is connected). The PSTN Switch acknowledges 2614 receipt of request. The Serving MSC 302 tells 2616 the mobile station 310 that it is trying the called party. The PSTN Switch responds 2618 with connection information. The Serving MSC 302 sends 2620 a message to mobile station 310 indicating it is OK to proceed with call. The mobile station 310 acknowledges 2622 and conversation may now begin.

In an exemplary embodiment of the present invention the voice traffic may be carried as EVRC on RTP/UDP/IP packets between the mobile station 310 and the Serving MSC 302 and as 64K PCM voice between the Serving MSC 302 and the PSTN switch. The HLR interactions may be carried out using IS-41 protocol elements. Figure 27 shows another exemplary embodiment in which the HLR interactions may be carried out using GSM-MAP protocol elements and the voice between the mobile station 310 and the Serving MSC 302 may be carried as GSM EFR on RTP/UDP/IP packets, and as 64K PCM voice circuits between the Serving MSC and the PSTN switch.

Enterprise to WWAN GSM telephone Call with Tandem Free Operation (TFO): In this case a mobile station 310 (MS1) initiates a telephone call to another mobile station (MS2) roaming in a GSM network. Since only mobile stations are involved in this call, it is possible to carry this call in a tandem-free operation; i.e., carry the call as GSM EFR

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without having to uncompress/decompress to 64K PCM. The logic of certain embodiments to implement such a call is described in connection with figure 28.

The mobile station 310 using SIP sends 2802 a call request to the Serving WLAN MSC 302. The Serving MSC 302 asks 2804 the HLR 114 to locate the called party using GSM MAP. The HLR 114 asks 2806 the Serving GSM MSC 110 to locate MS2, i.e., provide roaming number associated with MS2. The GSM MSC 2808 responds with MS2's roaming number to HLR 114. The HLR 114 sends 2810 routing response to WLAN Serving MSC 302. The Serving MSC 302 requests 2812 a connection capable of carrying voice traffic from the Media Gateway with TFO on trunk side. The Media Gateway responds 2814 with a connection response. The Serving MSC 302 sends 2816 a connection request to the GSM MSC. The GSM MSC 110 acknowledges 2818 receipt of request. The Serving WLAN MSC 302 tells 2820 the mobile station 310 that it is trying the called party. The GSM MSC 110 responds 2822 with connection information. The Serving MSC 302 sends 2824 a message to mobile station 310 indicating it is OK to proceed with call. The mobile station 310 acknowledges and conversation may now begin.

In this exemplary embodiment of the present invention the voice traffic may be carried as GSM EFR on RTP/UDP/IP packets between the MS and the Serving MSC and as GSM EFR in 64K DS0 as a TFO channel between the WLAN Serving MSC (Media Gateway) and the GSM MSC (or the GSM Radio Access Network).

Other Variations

A basic mechanism of the present invention is the handoff of the mobile station as it roams during a call from a WLAN to the WWAN environment. This mechanism assumes the existence of trunks connecting the WLAN and WWAN switches using a standard mobility management protocol such as IS-41. Figure 29 shows an exemplary embodiment of a method that may be used to affect handoffs in the absence of such connectivity, and exemplary logic is discussed in connection with figure 30. As shown in the figure and in accordance to the present invention as described previously, the mobile station 310 (MS) while engaged in a telephone call with Party A, who may be using a PSTN handset 2902 or a WWAN mobile handset 2904, senses both the WLAN and WWAN environments and determines that the WLAN environment is waning in intensity whereas the WWAN environment is gaining in intensity. Under such an arrangement,

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mobile station 310 may determine 3002 that handoff is imminent. Upon making this determination mobile station 310 requests 3004 the WLAN switch 302 to issue it a Temporary Local Directory Number (TLDN). As is well known to practitioners in the art a TLDN may be used by other telephone exchanges to route a call to the switch issuing the TLDN. Having received the TLDN the mobile station 310 continues roaming and the mobile station 310 or the WLAN switch or both may find 3006 that the connectivity between the mobile station 310 and the WLAN switch has been lost. In such an eventuality the WLAN switch temporarily places 3008 party A on hold (WLAN may inform Party A about the on going state of affairs by playing a pre-recorded announcement). The mobile station 310 upon sensing the WWAN environment and upon successful completion of registration in the WWAN environment, requests a call to be placed using the TLDN as the destination (called party). The WWAN switch routes 3010 the call to the WLAN switch using its routing logic dependent on the TLDN. The WLAN switch recognizes 3012 the TLDN and connects Party A to the incoming call. Thus, Party A and the MS resume the on going call albeit with an interruption.

Many enterprises make use of a Private Branch Exchange (PBX). PBX systems typically provide a feature-rich environment to the attached telephones, such as abbreviated dialing, multi-party calls and the like. In certain embodiments of the present invention a WLAN switch may be used in conjunction with a PBX system.

Figure 31 shows an exemplary embodiment of this arrangement. The WLAN 200 is connected to the PBX 3102 via standard supported interfaces such as ISDN PRI. Telephone calls originating from a handset connected to the PBX and destined for a WLAN-controlled handset may be delivered to the WLAN switch 3104 via the standard interface. The WLAN switch may use the standard interface to deliver telephone calls to the PBX.

A mobile station 310 may make calls using the WLAN air interface, and such calls will be communicated over the wired LAN 206 to WLAN switch 2904 via the IP links of LAN 206. Switch 3104 will then communicate the call signaling (and eventually voice or other data) over ISDN PRI link 3106 to the PBX switch 3102 which will handle the call as if it were from a PBX phone 3108 and thus provide the PBX services to the mobile station. For example, if the mobile station used an abbreviated dialing scheme,

the PBX would make the appropriate connections and communication would be conducted via the PBX switch 3102.

For internal calls, the WLAN switch 3104 essentially acts as a protocol converter, receiving the mobile station signaling and data as IP and providing it to the PBX via the ISDN PRI links as ISDN information.

For external calls, certain embodiments operate as follows. The WLAN switch 3104 detects that the mobile station desires to call an outside party. This may be done by analyzing the called party information, for example, to see if certain numbering plan information is used, such as prefixing the called number with the number '9'. In such case, the switch 3104 communicates with the WWAN switch 3112 and requests a TLDN to be later associated with the called party information e.g., called party number "123." When it receives such TLDN, the switch 3104 then makes a request to the PBX switch 3102 via link 3106 to connect the circuits associated with the mobile station to the WWAN switch 3112 using the TLDN i.e., requests the PBX to connect a call to the TLDN as the called party. The WWAN switch 3112 recognizes that the incoming call request with TLDN is for the previously remembered called party number 123 (i.e., WWAN switch 3104 associates the issued TLDN with previously received called party number "123" from WLAN switch 3104) and proceeds to route call to called party number "123" as dictated by standard routing logic. Thus, PBX 3102 requests call to destination TLDN but WWAN switch 3112 recognizes that the call is actually meant for destination "123" and routes the call to "123". The TLDN serves as a tag identifying the "signaling" on IP link 3114 and the request from the PBX on ISDN PRI link 3110. In this fashion, any subsequent signaling or link 3114 associated with mobile station 310 will be associated with the correct bearer circuits on link 3110.

In terms of mobility management, roaming may proceed as explained above. Hard handoffs may proceed as explained above if there exist mobility management trunks between the WWAN switch 3312 and the WLAN switch 3104. This logic is shown in figures 12-14 and 19-21 with the associated descriptions of hard handoffs under various network conditions. In the absence of such trunks a handoff may proceed with regard to the use of TLDN as a handoff mechanism – namely as the mobile station roams into a WWAN area and loses radio contact with the WLAN, the mobile station will perform a handoff by automatically reconnecting with the call by using the TLDN. In this instance,

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the WLAN switch may inform the mobile station of the TLDN to use either during call set up, or as explained above in response to the mobile station's request (e.g., the WLAN switch 3104 may cache the TLDN and await the request of the mobile station).

In this arrangement the WWAN MSC 3112 anchors the call. Certain variations are possible. For example, during handoffs the WWAN MSC may tear down the links previously used to the PBX. This is efficient for two party calls. However to support calls in which multiple parties in the PBX domain participate, the links to the PBX must remain up. In this situation, the WWAN MSC 3112 must patch in the mobile station to the existing call.

The above discussion and the following claims at times refer to specific WLAN standards such as 802.11. This is typically done to use a very specific example. In many instances reference is made to 802.x. The designation of 'x' is used to indicate a wider applicability, i.e., to any of the 802 WLAN standards.

Though some of the discussion is with reference to voice calls, persons skilled in the art that the above teachings and following claims are also directed to data calls as well.

It will be further appreciated that the scope of the present invention is not limited to the above-described embodiments, but rather is defined by the appended claims, and that these claims will encompass modifications of and improvements to what has been described.

What is claimed is:

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1. A method of selecting an air interface protocol for a mobile station to use, wherein the mobile station includes (a) logic to communicate according to an 802.xx wireless local area network air interface protocol (WLAN logic), (b) logic to communicate according to a wireless wide area network air interface protocol (WWAN logic), and (c) logic to select one of the WLAN logic and the WWAN logic to communicate on an air interface, the method comprising:

the mobile station detecting RF energy in the 802.xx spectrum;

in response to the energy detection step, determining whether there is an 802.xx WLAN capable of servicing the mobile station by performing a scanning operation; and

if there is an 802.xx WLAN capable of servicing the mobile station, the mobile station selecting the WLAN logic.

2. The method of claim 1 wherein the scanning operation is a passive scanning operation in which the mobile station searches for a beacon frame broadcast by a 802.xx WLAN.

3. The method of claim 1 wherein the scanning operation is an active scanning operation in which the mobile station transmits probe request frames and waits for probe responses from the 802.xx WLAN.

4. The method of claim 2 wherein the beacon frame includes a SSID identifying an access point of the 802.xx WLAN.

5. The method of claim 3 wherein the probe response includes a SSID identifying an access point of the 802.xx WLAN.

6. The method of claim 4 wherein the mobile station compares the SSID within the beacon frame with a set of SSIDs to determine if the SSID within the beacon frame is within the set of SSIDs and if so determining that the 802.xx WLAN sensed is a valid 802.xx WLAN to service the mobile station.

7. The method of claim 5 wherein the mobile station compares the SSID within the probe response with a set of SSIDs to determine if the SSID within the probe

response is within the set of SSIDs and if so determining that the 802.xx WLAN sensed is a valid 802.xx WLAN to service the mobile station.

8. The method of claim 6 wherein the mobile station and the 802.xx WLAN authenticate the identity of each other.

9. The method of claim 7 wherein the mobile station and the 802.xx WLAN authenticate the identity of each other.

10. The method of claim 1 wherein the WWAN has information identifying the areas in which capable WLANs operate and wherein the WWAN provisions the mobile station with at least a subset of such information, and wherein the mobile station uses such area-identifying information to determine whether to perform the RF energy detection operation.

11. The method of claim 10 wherein the area-identifying information is cell ids and wherein the mobile station compares the cell id information in which it is operating with the provisioned cell ids.

12. The method of claim 10 wherein the area-identifying information is geographical positioning satellite (GPS) information and wherein the mobile station determines its GPS coordinates and compares it against the provisioned GPS information.

13. The method of claim 1 wherein the mobile station compares the RF energy value with a threshold value and wherein the mobile station detects the RF energy of the WWAN and compares said RF energy of the WWAN with a predetermined value and wherein the comparisons of the RF energy values with corresponding thresholds is used by the mobile station in selecting whether to communicate with the 802.xx WLAN and the WWAN.

14. The method of claim 1 wherein the WWAN has information identifying the areas in which capable WLANs operate and wherein the WWAN provisions the mobile station with at least a subset of such information, and wherein the mobile station uses such area-identifying information to determine whether to perform the RF energy detection operation.

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15. The method of claim 10 wherein the area-identifying information includes information identifying WLANs other than that used by a service plan of the mobile station.

16. The method of claim 15 wherein the information identifying WLANs includes information identifying WLANs of enterprises accepting service of the mobile station.

17. The method of claim 10 wherein the mobile station is provisioned with the area information via SMS messages from the WWAN.

18. The method of claim 10 wherein the provisioning of area information in response to the multimode mobile station causing location update messages to a HLR of the WWAN.

19. A multimode mobile station, comprising

first air interface logic to communicate according to an 802.xx wireless local area network air interface protocol;

second air interface logic to communicate according to a wireless wide area network air interface protocol;

logic to sense RF energy in the 802.xx spectrum;

logic, responsive to the sensing logic, to determine whether there is an 802.xx WLAN capable of servicing the multimode mobile station by performing a scanning operation; and

logic, responsive to the determining logic, to select the first air interface logic if there is an 802.xx WLAN capable of servicing the multimode mobile station.

20. A wireless communication system, comprising:

a wireless local area network (WLAN),

a wireless wide area network (WWAN), including at least one MSC;

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a multimode mobile station including logic to determine whether to communicate according to an air interface protocol for the WLAN or to communicate according to an air interface protocol for the WWAN.

21. The system of claim 20 wherein the WWAN includes logic to provide information to the multimode mobile station to inform the mobile station of geographic areas of WLANs, and wherein the logic to determine utilizes said information to determine whether to communicate according to the air interface protocol for the WLAN or to communicate according to the air interface protocol for the WWAN.

22. A method of managing mobility of a mobile station across an 802.xx wireless local area network (WLAN) and a wireless wide area network (WWAN) in which a mobile switching center (MSC) has been provisioned to act as a serving MSC for the WLAN, comprising:

(a) the mobile station detecting the RF energy of the WLAN and validating its ability to be a member of the WLAN;

(b) in response to step (a), the mobile station issuing a registration request to the serving MSC for the WLAN;

(c) in response to step (b), the serving MSC for the WLAN causing the WWAN to recognize that the mobile station is registered with the serving MSC for the WLAN and that the mobile station is no longer served by a prior MSC;

(d) the mobile station communicating to entities outside of the WLAN by communicating with the WLAN via a WLAN protocol and the WLAN communicating with the WWAN via the serving MSC for the WLAN.

23. The method of claim 22 wherein the mobile station issues a registration request by sending a SIP Register message on the WLAN via a WLAN air interface protocol to request registration therein, and the WLAN communicates the registration request to the MSC serving the WLAN.

24. The method of claim 22 further including the MSC serving the WLAN sending a de-registration request to an MSC that previously served the mobile station.

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25. The method of claim 22 wherein the MSC serving the WLAN sends a registration notification message to an HLR to update the WWAN with location information of the mobile station, and wherein the HLR communicates with a prior MSC to cancel service thereat of the mobile station,

26. The method of claim 22 wherein the MSC serving the WLAN sends an update location message to an HLR to update the WWAN with location information of the mobile station, and wherein the HLR communicates with a prior MSC to cancel service thereat of the mobile station, and wherein the HLR communicates with the MSC serving the WLAN to insert thereat the mobile station as a subscriber for service.

27. The method of claim 22 wherein a mobile station detects the RF energy of the WLAN and validates its ability to be a member of the WLAN while the mobile station is participating in a call using a WWAN air interface protocol and in response thereto

sending a message to a source MSC that is servicing the call that a handoff is desired;

the source MSC analyzing the message, establishing itself as an anchor MSC, and establishing communication channels with a target MSC servicing the detected WLAN;

the mobile station beginning communication with the WLAN via a WLAN air interface;

the WLAN forwarding messages to the target MSC serving the WLAN via IP communication; and

the target MSC relaying those communication to the anchor MSC.

28. The method of claim 27 wherein the mobile stations sends via a WLAN air interface protocol a handoff request message as an overloaded SIP command and the WLAN communicates the handoff request message to the target MSC.

29. The method of claim 22 further including

a mobile station determining that it should communicate via a WWAN air interface protocol and not via a WLAN air interface protocol;

the mobile station issuing a registration request to the WWAN via a base station controller (BSC) and MSC corresponding to a location in which the mobile station resides;

the corresponding MSC causing the WWAN to recognize that the mobile station is registered with the corresponding MSC and that the mobile station is no longer served by a prior MSC which served the mobile station when it was communicating according to a WLAN air interface protocol.

30. The method of claim 29 wherein a mobile station determines that it should communicate according to a WWAN air interface protocol while the mobile station is participating in a call under a WLAN air interface protocol and in response thereto

sending a message to a source MSC that is servicing the call that a handoff is desired;

the source MSC analyzing the message, establishing itself as an anchor MSC, and establishing communication channels with a target MSC servicing a geographic WWAN area in which the mobile station resides;

the mobile station beginning communication with the WWAN and the target MSC relaying those communication to the anchor MSC.

31. The method of claim 30 wherein the mobile station informs the MSC serving the WLAN of the cell ids of the WWAN geographic area, and wherein the source MSC uses the cell ids information to establish communication channels with the target MSC.

32. The method of claim 31 wherein the mobile station uses an overloaded SIP Info message to communicate the cell id information to the source MSC.

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33. The method of claim 29 wherein a mobile station determines that it should communicate according to a WWAN air interface protocol while the mobile station is participating in a call under a WLAN air interface protocol and in response thereto

sending a message to a source MSC to request a temporary local directory number (TLDN)

the source MSC providing a TLDN to the mobile station;

the source MSC causing a called party of the call to be placed on hold and the mobile station requests a call to be made using the TLDN as a called party;

the WWAN causing call connections to be made connecting the mobile station with the TLDN to resume the call.

34. A wireless communication system, including

a wireless local area network (WLAN) including logic to communicate according to a WLAN air interface protocol;

a wireless wide area network (WWAN) including logic to communicate according to a WWAN air interface protocol, the WWAN including at least one MSC for serving the WLAN and in IP communication therewith;

a mobile station including logic to communicate according to the WLAN air interface protocol, logic to communicate according to the WWAN air interface protocol, and logic to communicate mobility management messages to the WLAN as overloaded SIP messages for forwarding to the at least one MSC.

35. A method of providing a wireless wide area network (WWAN) service to a mobile station serviced in a wireless local area network (WLAN), comprising:

provisioning a MSC to serve the WLAN;

the MSC that serves the WLAN receiving WWAN messages that provide the WWAN service;

the MSC forming SIP messages using the received WWAN messages;

the MSC delivering the SIP messages to the WLAN via an IP link;

the WLAN delivering the SIP messages to the mobile station via a WLAN air interface protocol.

36. The method of claim 35 wherein the WWAN service is a Short Message Service (SMS) and wherein the WWAN includes a SMS Center for delivering SMS messages on the WWAN and wherein the MSC forms SIP Invite messages with SMS payload and delivers said SIP Invite messages to the WLAN.

37. The method of claim 35 wherein the WWAN service is a Message Wait Notification (MWN) and wherein the WWAN provides MWN messages to the WWAN and wherein the MSC forms SIP Invite messages with MWN information and delivers said SIP Invite messages to the WLAN.

38. The method of claim 35 wherein the MSC that services the WLAN and an MSC servicing the WWAN cooperate to provide TFO call services between an mobile station operating in the WLAN and a mobile station operating in the WWAN.

39. A method of internetworking a mobile station to operate in a wireless wide area network (WWAN), comprising:

provisioning a switch to communicate with the WLAN via IP communication and to communicate with a PBX via a PBX interface;

the switch receiving mobile station communications via the WLAN;

the switch converting said mobile station communications to a format compatible with the PBX interface and forwarding the converted communications to the PBX;

the PBX receiving and handling the converted communications.

40. The method of claim 39 wherein the switch is further provisioned to communicate with a WWAN and wherein the switch analyzes the mobile station communications and determines that the communications address an entity external to a domain of the PBX and in response thereto

the switch requesting a TLDN from a MSC serving the WWAN;

in response to receiving a TLDN from the MSC, the switch sending a message to the PBX to connect the mobile station call to the specified TLDN;

the PBX connecting the mobile station call to the specified TLDN.

41. The method of claim 40 further including

the mobile station roaming during the call,

the mobile station switching to an WWAN air interface protocol;

the mobile station reconnecting to the call by specifying the TLDN of the call.

42. The method of claim 41 wherein the mobile station automatically reconnects to the call without user intervention.

43. The method of claim 41 wherein the PBX tears down call connections to the MSC when the mobile station is detected as having lost communication with the switch.

44. The method of claim 41 wherein the PBX maintains call connections to the MSC when the mobile station is detected as having lost communication with the switch.

45. The method of claim 40 further including

the mobile station roaming during the call,

the mobile station determining that it should communicate according to a WWAN air interface protocol while the mobile station is participating in a call under a WLAN air interface protocol and in response thereto

sending a message to a source MSC that is servicing the WLAN that a handoff is desired;

the source MSC analyzing the message, establishing an anchor MSC, and establishing communication channels with a target MSC servicing a geographic WWAN area in which the mobile station resides;

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the mobile station beginning communication with the WWAN and the target MSC relaying those communication to the anchor MSC.

46. The method of claim 45 wherein the mobile station informs the MSC serving the WLAN of the cell ids of the WWAN geographic area, and wherein the source MSC uses the cell ids information to establish communication channels with the target MSC.

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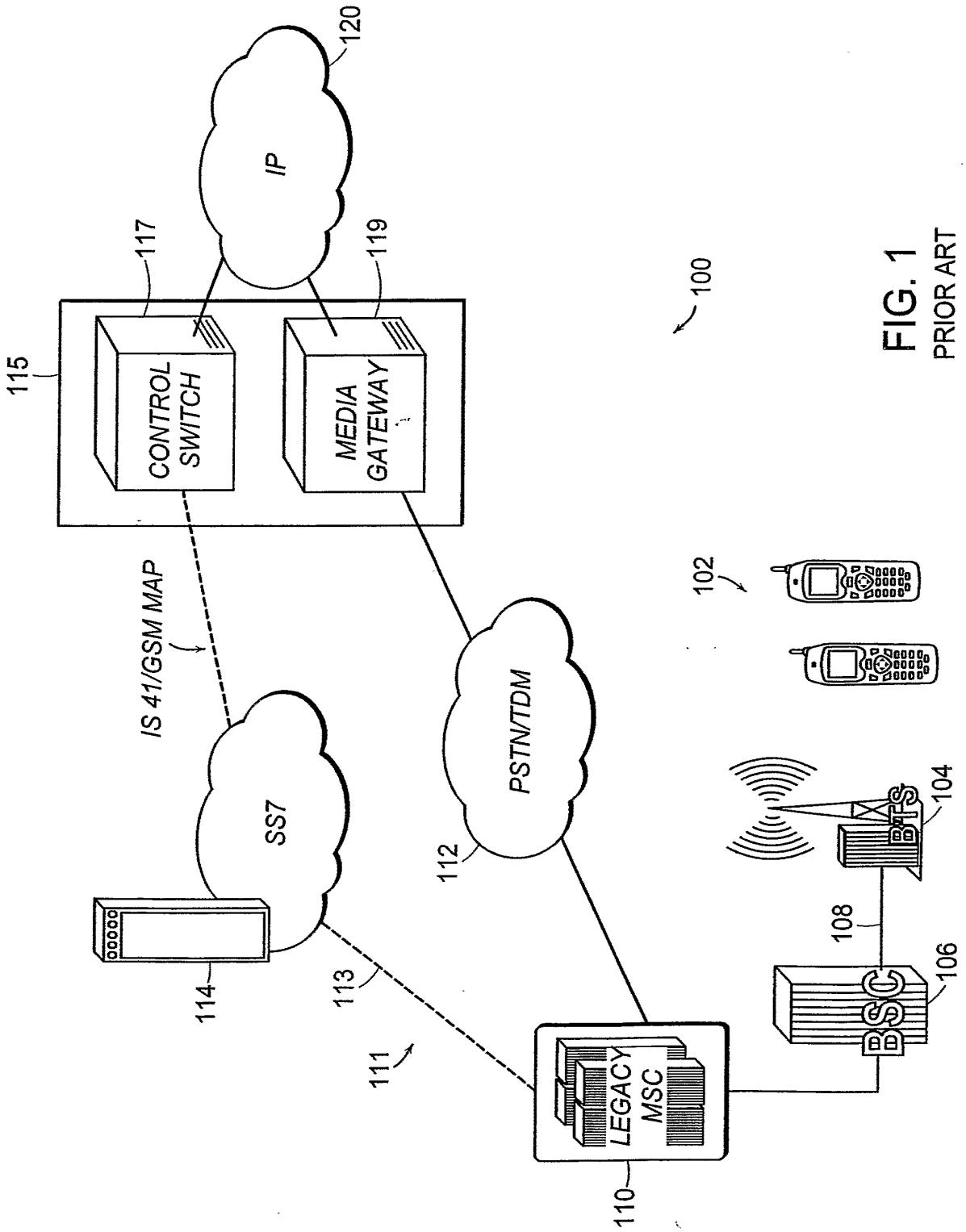


FIG. 1
PRIOR ART

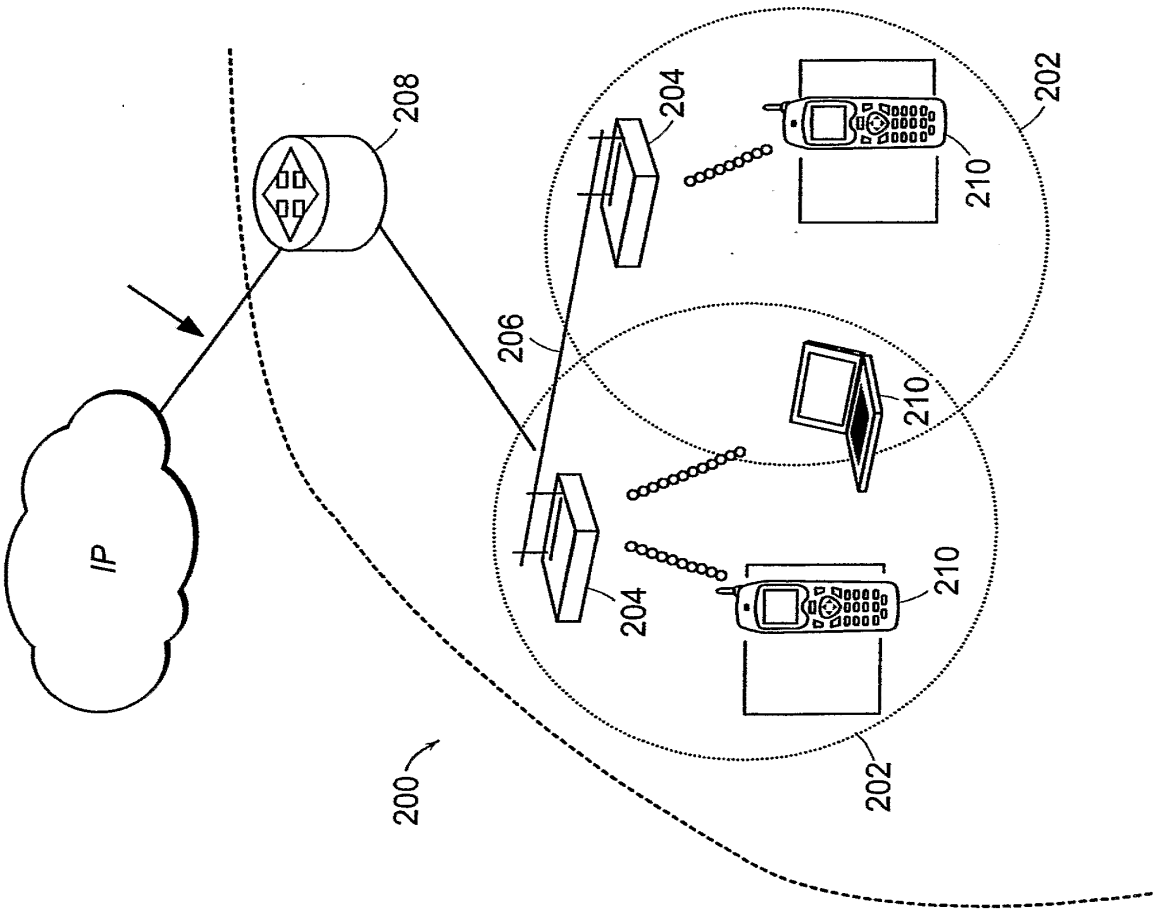


FIG. 2
PRIOR ART

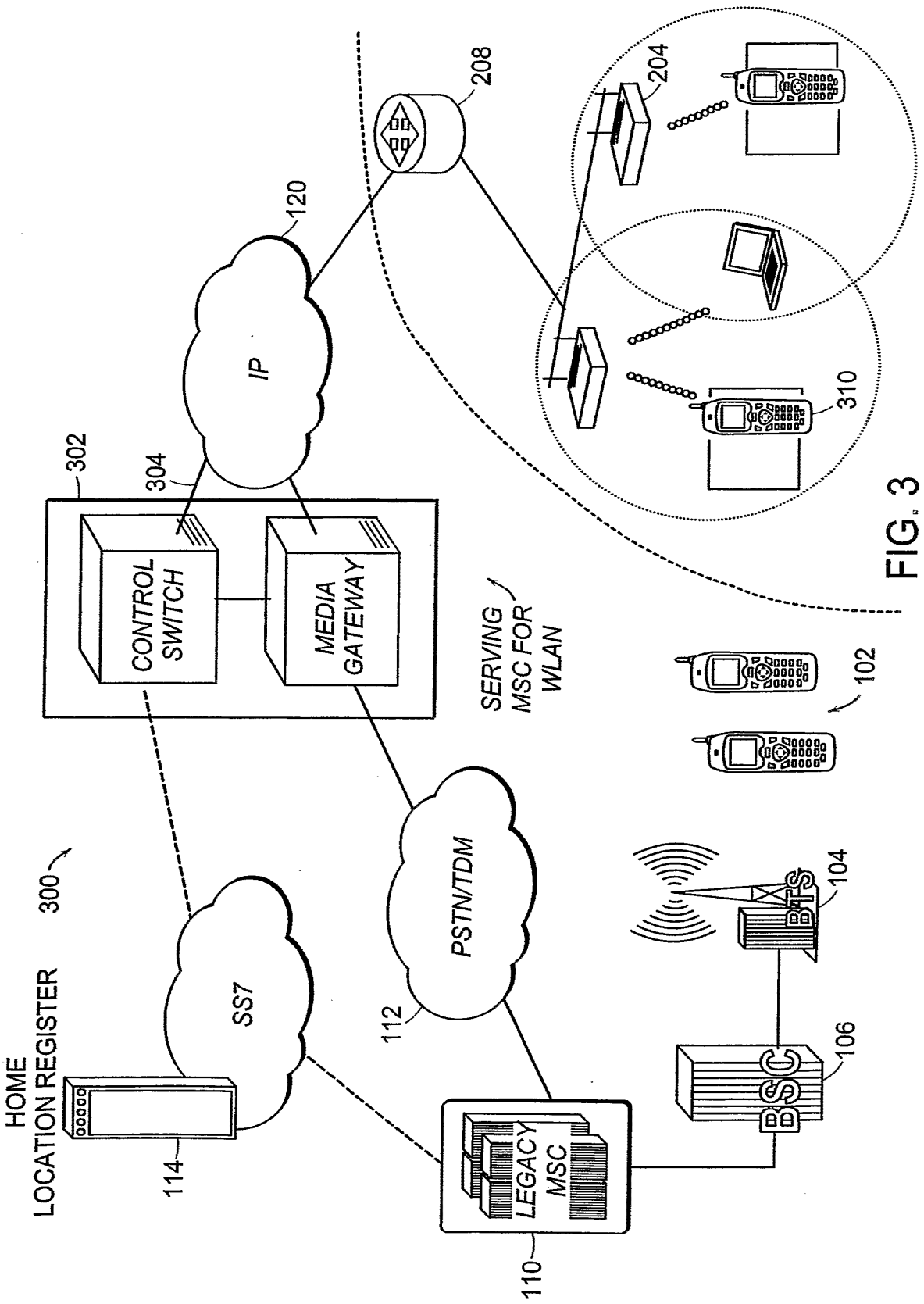

HOME LOCATION REGISTER
300
SS7
114
PSTN/TDM
112
IP
120
208
204
310
302
304
CONTROL SWITCH
MEDIA GATEWAY
SERVING MSC FOR WLAN
102
104
106
LEGACY MSC
110

FIG. 3

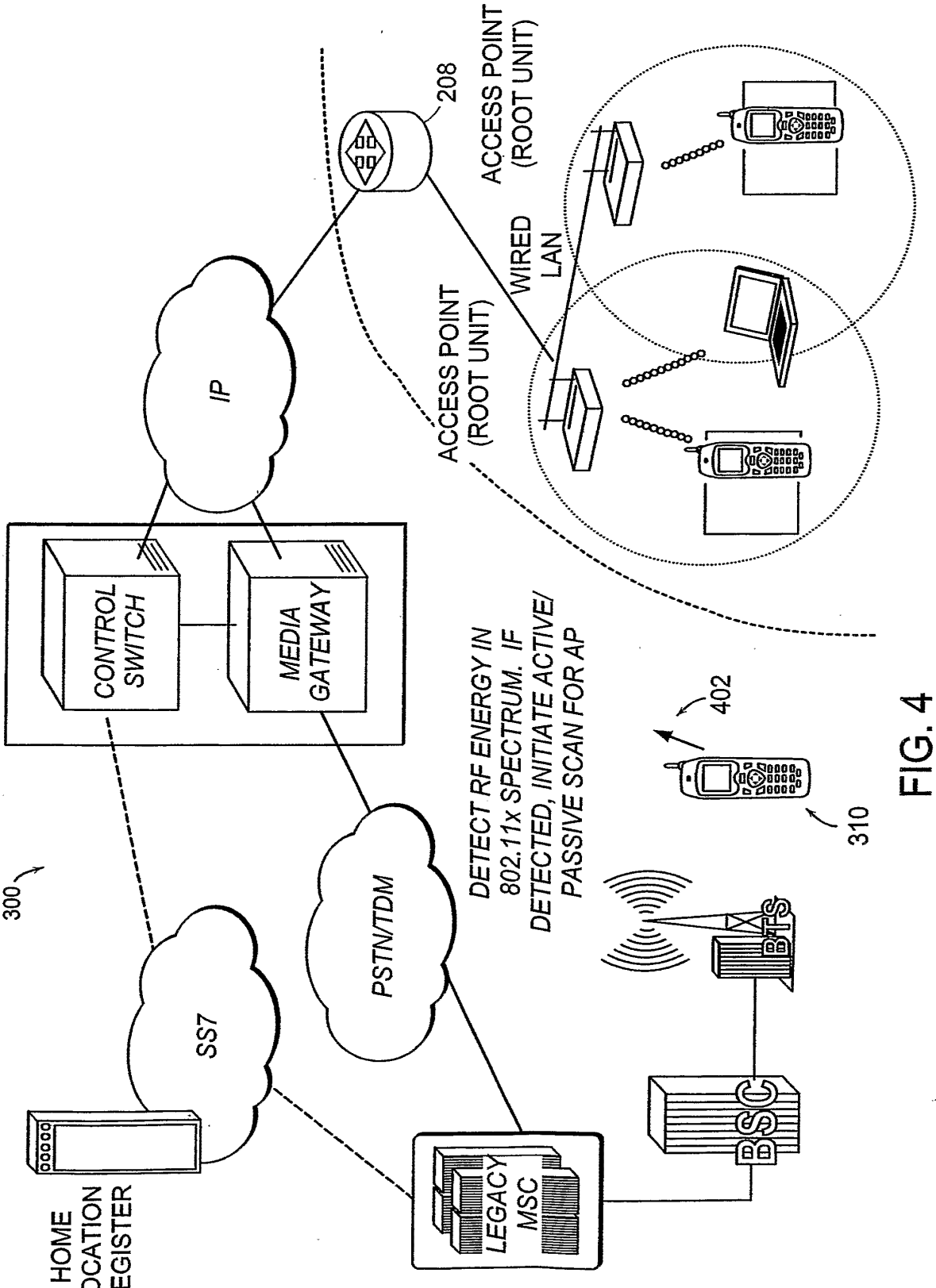

300
HOME LOCATION REGISTER
SS7
PSTN/TDM
LEGACY MSC
CONTROL SWITCH
MEDIA GATEWAY
IP
208
ACCESS POINT (ROOT UNIT)
WIRED LAN
ACCESS POINT (ROOT UNIT)
DETECT RF ENERGY IN 802.11x SPECTRUM. IF DETECTED, INITIATE ACTIVE/ PASSIVE SCAN FOR AP
402
310

FIG. 4

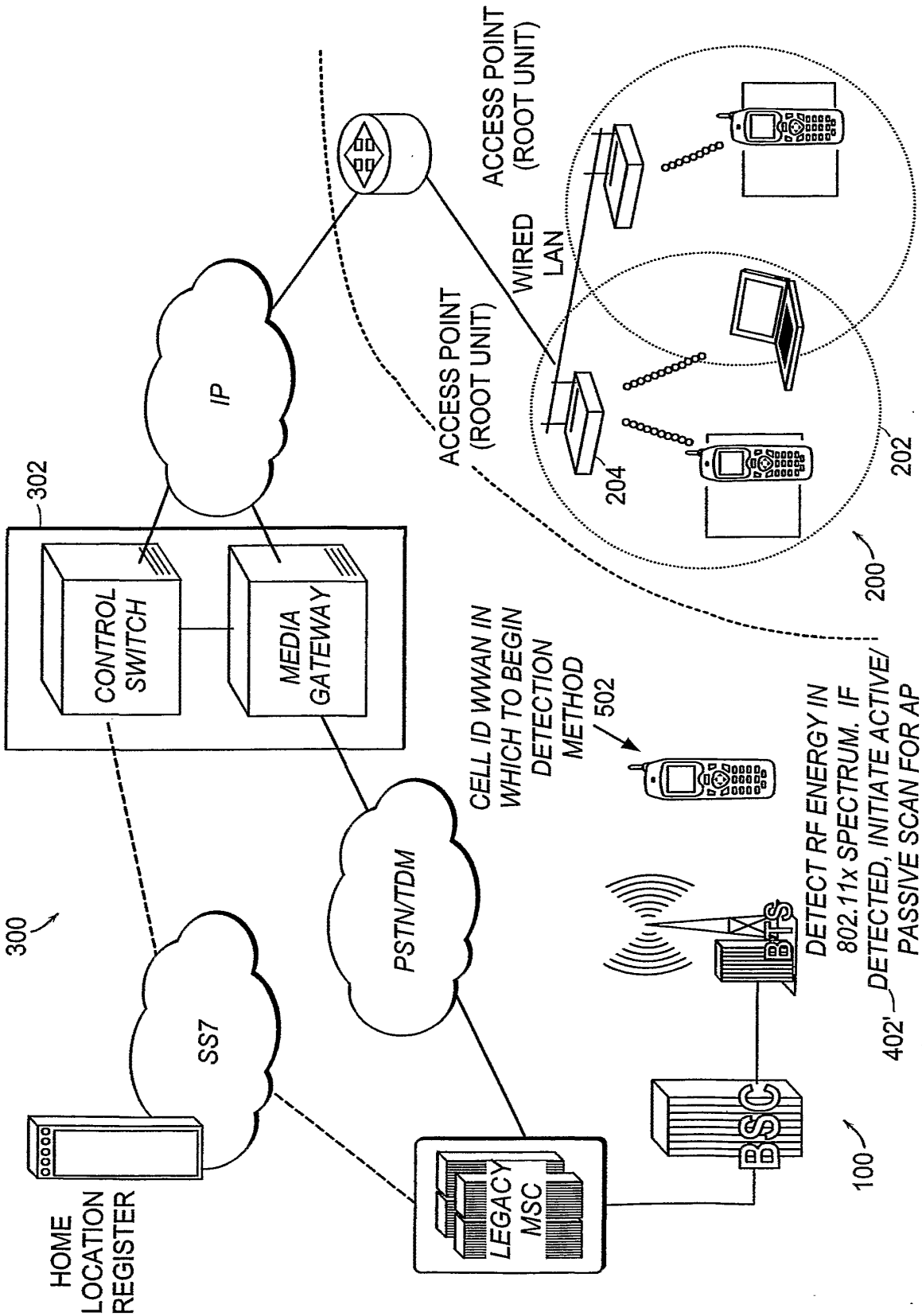

ACCESS POINT (ROOT UNIT)
WIRED LAN
ACCESS POINT (ROOT UNIT)
IP
302
CONTROL SWITCH
MEDIA GATEWAY
204
202
200
CELL ID WWAN IN WHICH TO BEGIN DETECTION METHOD
502
DETECT RF ENERGY IN 802.11x SPECTRUM. IF DETECTED, INITIATE ACTIVE/ PASSIVE SCAN FOR AP
402'
PSTN/TDM
300
SS7
HOME LOCATION REGISTER
LEGACY MSC
100

FIG. 5

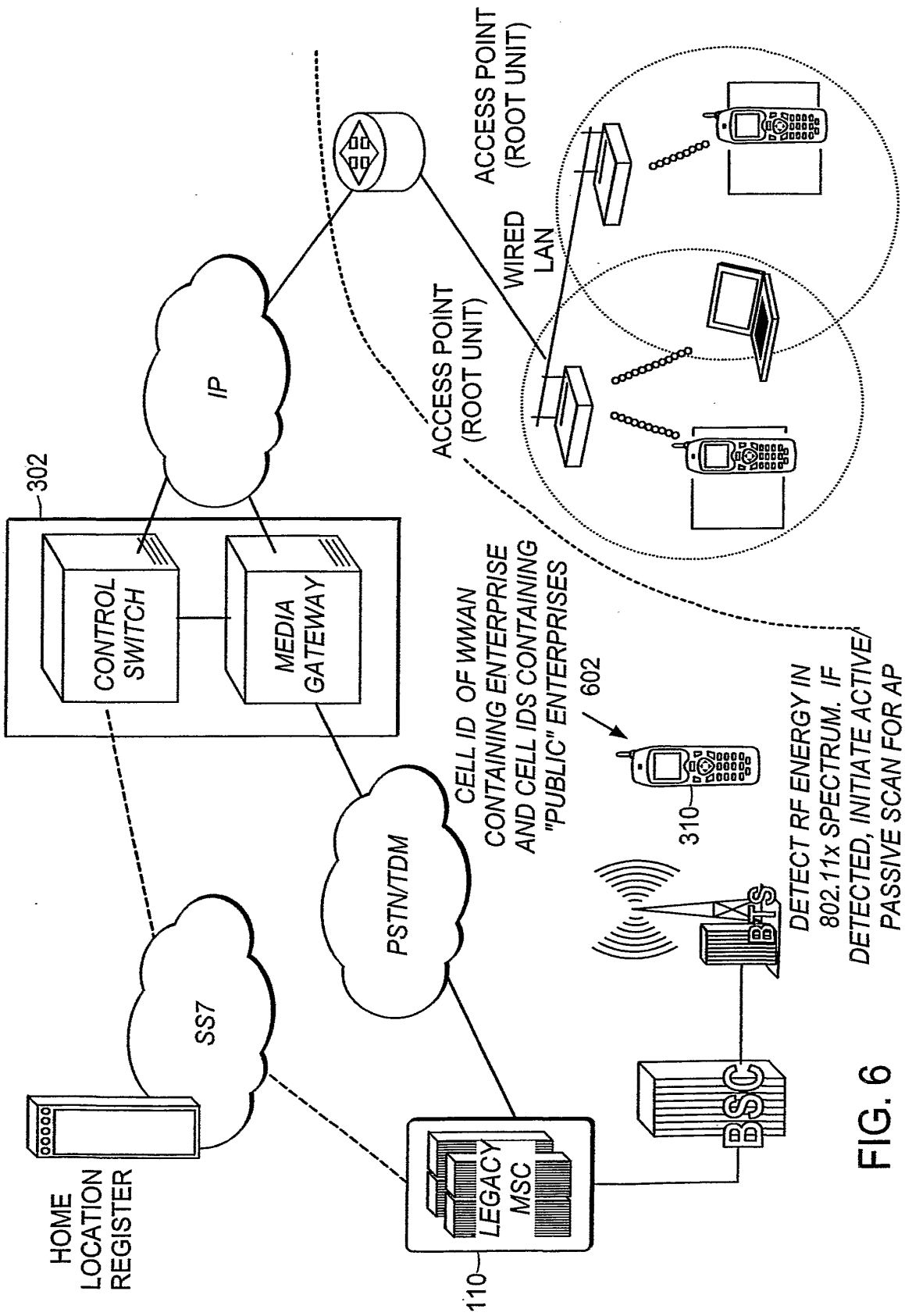

ACCESS POINT (ROOT UNIT)
WIRED LAN
ACCESS POINT (ROOT UNIT)
IP
302
CONTROL SWITCH
MEDIA GATEWAY
CELL ID OF WWAN CONTAINING ENTERPRISE AND CELL IDS CONTAINING "PUBLIC" ENTERPRISES
602
310
DETECT RF ENERGY IN 802.11x SPECTRUM. IF DETECTED, INITIATE ACTIVE/ PASSIVE SCAN FOR AP
PSTN/TDM
SS7
HOME LOCATION REGISTER
LEGACY MSC
110

FIG. 6

CDMA
MULTI-MODE PHONE
IS95/CDMA2000
+
WLAN MODEM
+
VoIP (SIP/RTP/UDP/IP)
+
MOBILITY VIA PREFERRED
EMBODIMENT CLIENT
GSM/UMTS
MULTI-MODE PHONE
GSM/UMTS
+
WLAN MODEM
+
VoIP (SIP/RTP/UDP/IP)
+
MOBILITY VIA PREFERRED
EMBODIMENT CLIENT
SANYO
310

FIG. 7

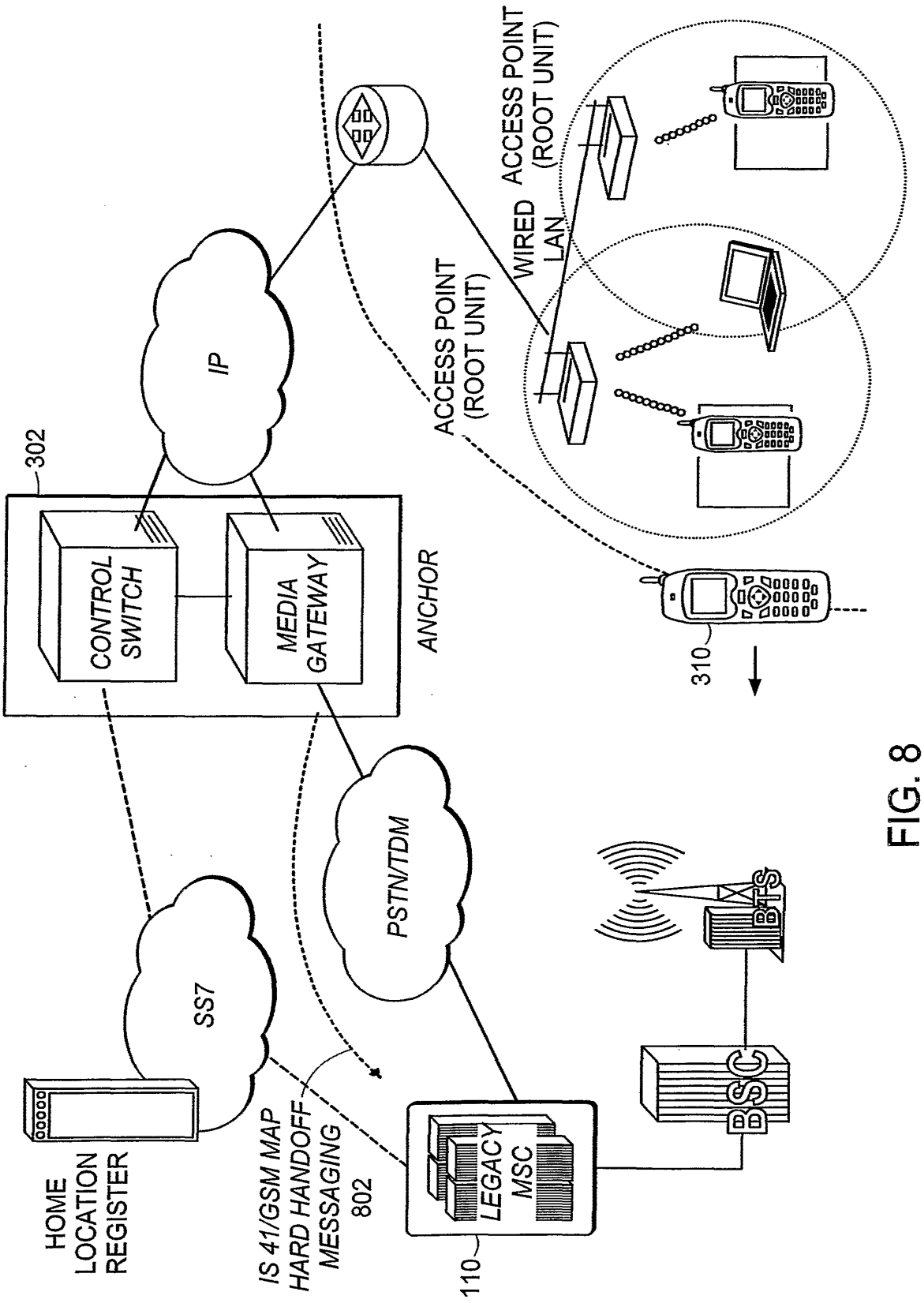

ACCESS POINT (ROOT UNIT)
WIRED LAN
ACCESS POINT (ROOT UNIT)
IP
302
CONTROL SWITCH
MEDIA GATEWAY
ANCHOR
310
PSTN/TDM
SS7
HOME LOCATION REGISTER
IS 41/GSM MAP HARD HANDOFF MESSAGING 802
LEGACY MSC
110
BTS
BSC

FIG. 8

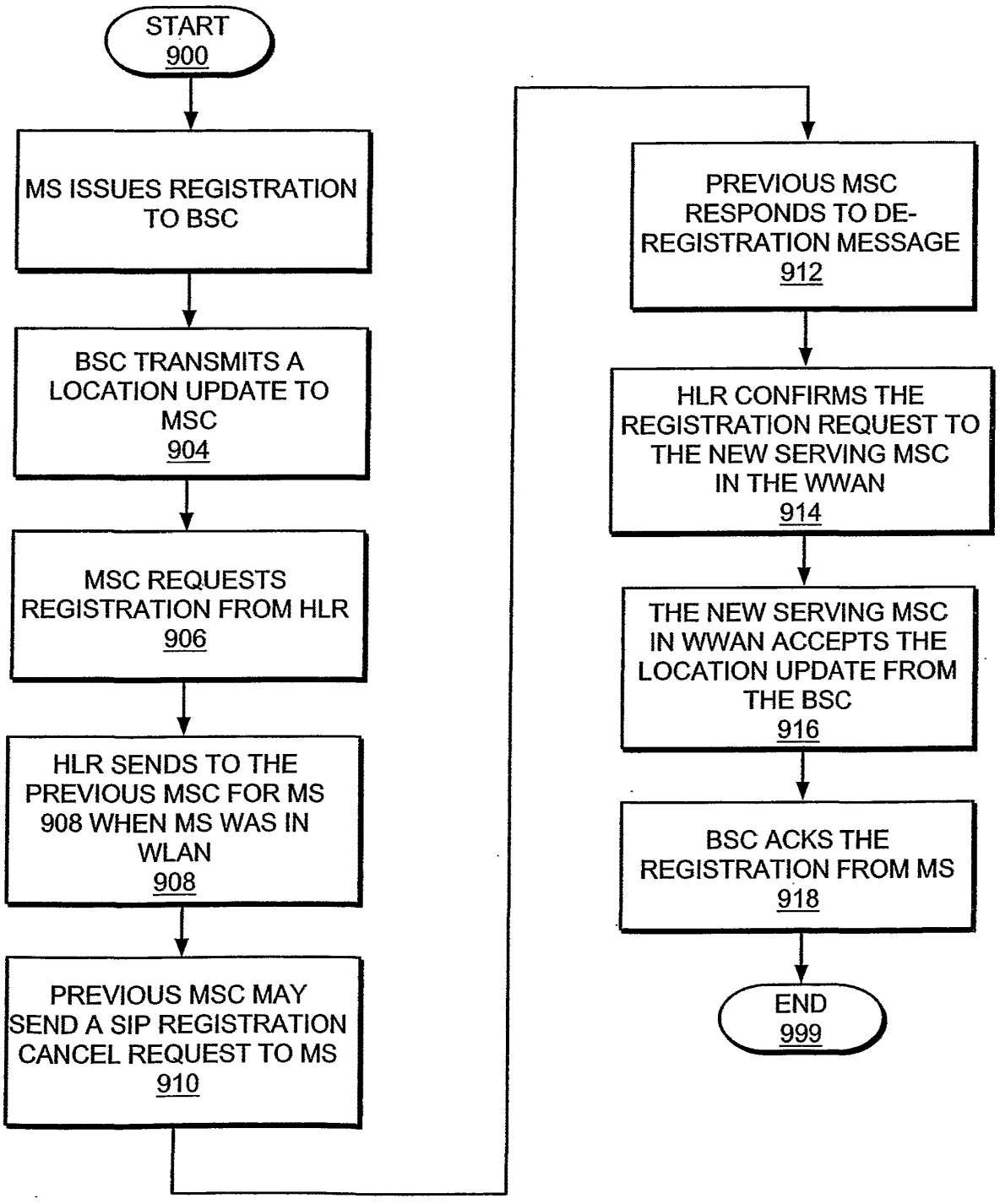

START
900
MS ISSUES REGISTRATION TO BSC
BSC TRANSMITS A LOCATION UPDATE TO MSC
904
MSC REQUESTS REGISTRATION FROM HLR
906
HLR SENDS TO THE PREVIOUS MSC FOR MS 908 WHEN MS WAS IN WLAN
908
PREVIOUS MSC MAY SEND A SIP REGISTRATION CANCEL REQUEST TO MS
910
PREVIOUS MSC RESPONDS TO DE-REGISTRATION MESSAGE
912
HLR CONFIRMS THE REGISTRATION REQUEST TO THE NEW SERVING MSC IN THE WWAN
914
THE NEW SERVING MSC IN WWAN ACCEPTS THE LOCATION UPDATE FROM THE BSC
916
BSC ACKS THE REGISTRATION FROM MS
918
END
999

FIG. 9

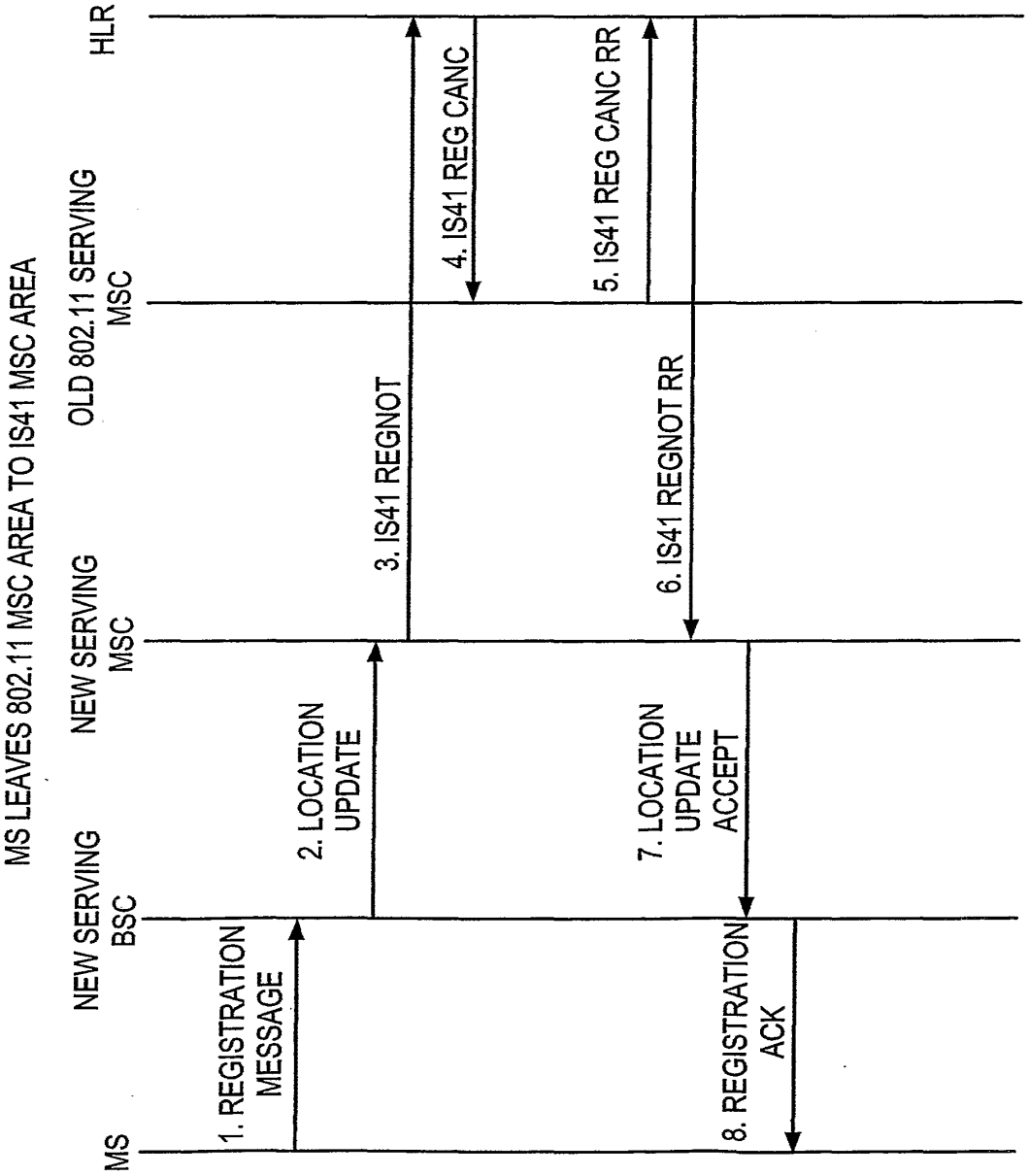

MS LEAVES 802.11 MSC AREA TO IS41 MSC AREA
MS
NEW SERVING BSC
NEW SERVING MSC
OLD 802.11 SERVING MSC
HLR
1. REGISTRATION MESSAGE
2. LOCATION UPDATE
3. IS41 REGNOT
4. IS41 REG CANC
5. IS41 REG CANC RR
6. IS41 REGNOT RR
7. LOCATION UPDATE ACCEPT
8. REGISTRATION ACK

FIG. 10

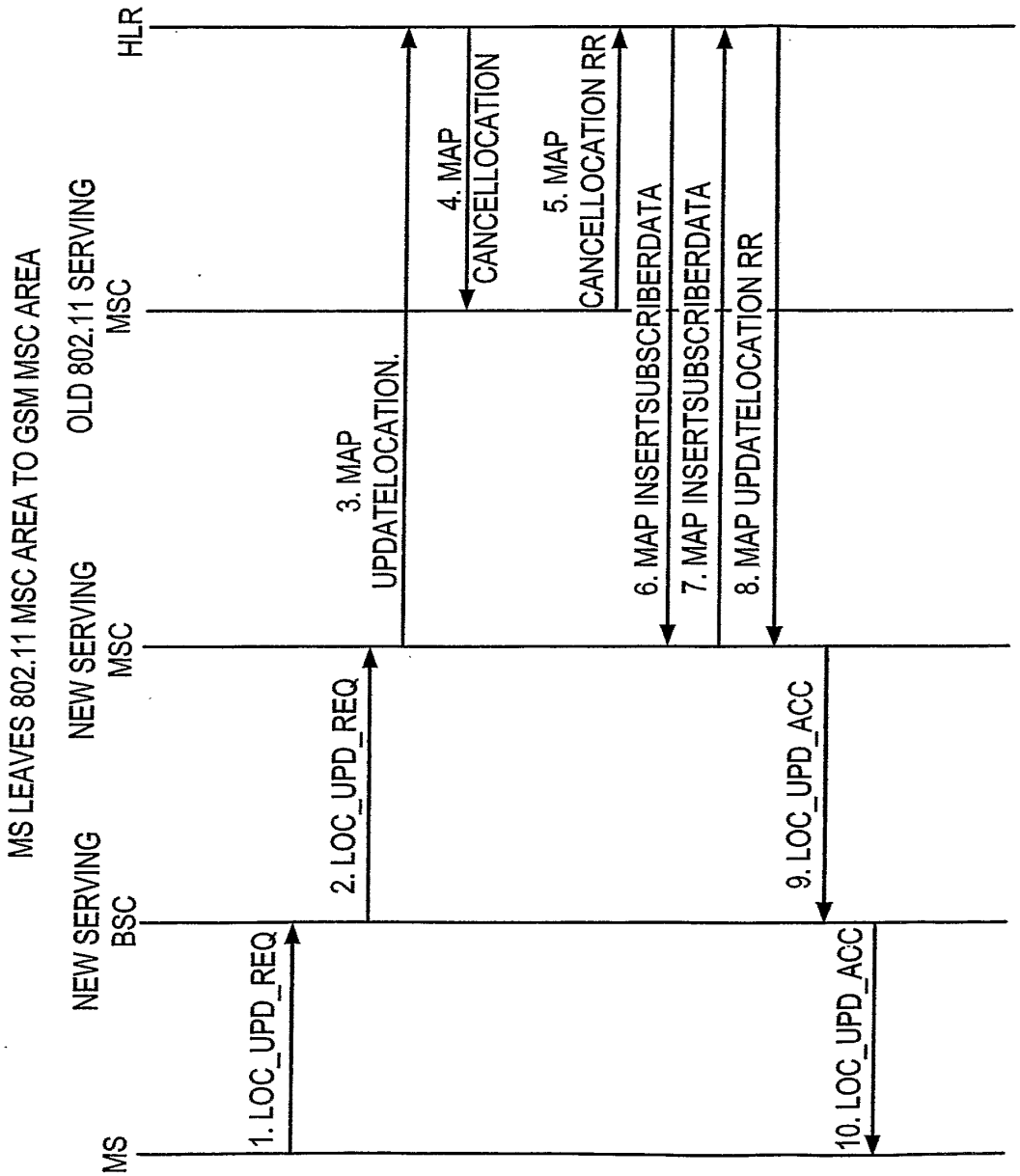

MS LEAVES 802.11 MSC AREA TO GSM MSC AREA
MS
NEW SERVING BSC
NEW SERVING MSC
OLD 802.11 SERVING MSC
HLR
1. LOC_UPD_REQ
2. LOC_UPD_REQ
3. MAP UPDATELOCATION.
4. MAP CANCELLOCATION
5. MAP CANCELLOCATION RR
6. MAP INSERTSUBSCRIBERDATA
7. MAP INSERTSUBSCRIBERDATA
8. MAP UPDATELOCATION RR
9. LOC_UPD_ACC
10. LOC_UPD_ACC

FIG. 11

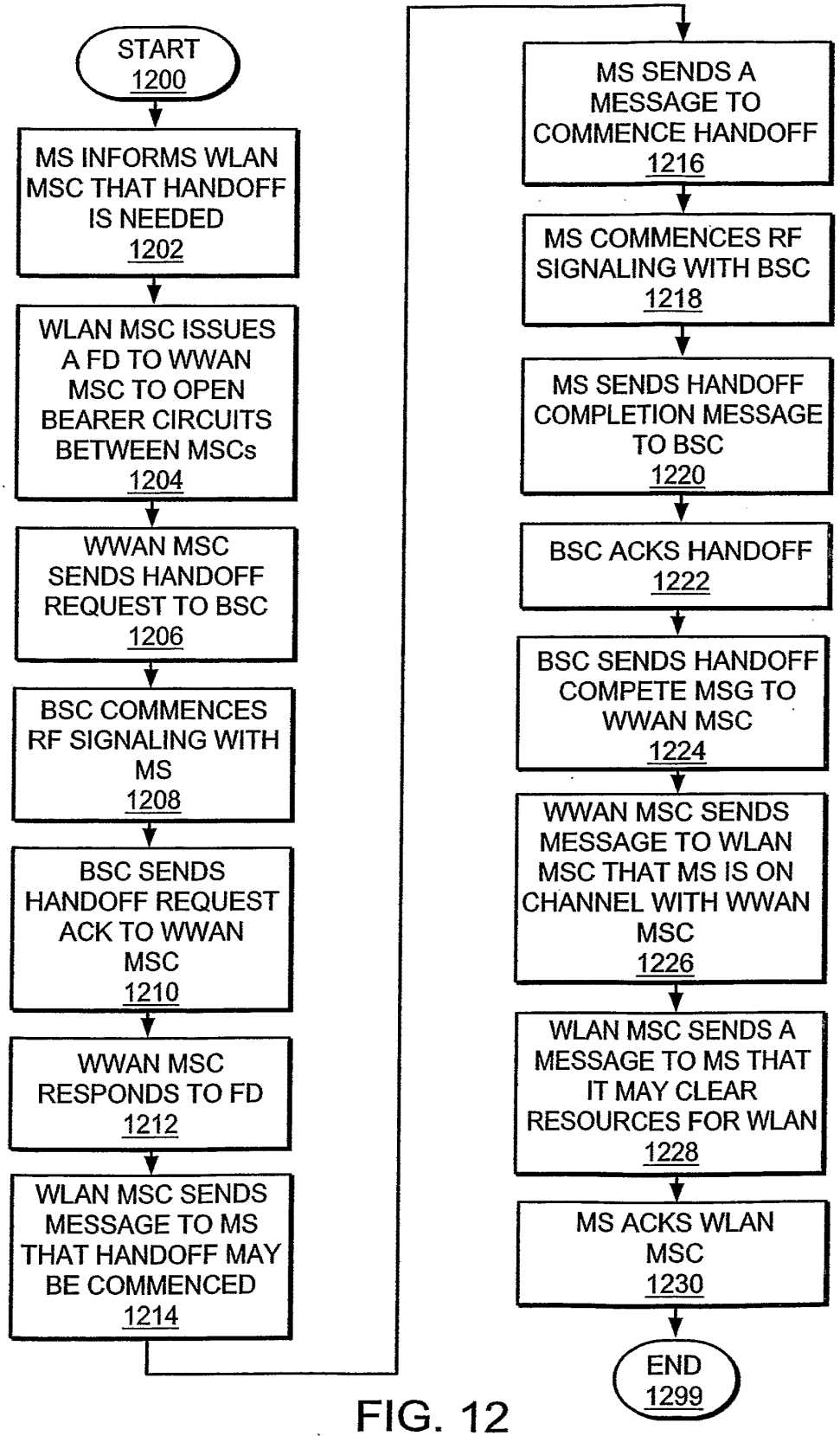

START
1200
MS INFORMS WLAN MSC THAT HANDOFF IS NEEDED
1202
WLAN MSC ISSUES A FD TO WWAN MSC TO OPEN BEARER CIRCUITS BETWEEN MSCs
1204
WWAN MSC SENDS HANDOFF REQUEST TO BSC
1206
BSC COMMENCES RF SIGNALING WITH MS
1208
BSC SENDS HANDOFF REQUEST ACK TO WWAN MSC
1210
WWAN MSC RESPONDS TO FD
1212
WLAN MSC SENDS MESSAGE TO MS THAT HANDOFF MAY BE COMMENCED
1214
MS SENDS A MESSAGE TO COMMENCE HANDOFF
1216
MS COMMENCES RF SIGNALING WITH BSC
1218
MS SENDS HANDOFF COMPLETION MESSAGE TO BSC
1220
BSC ACKS HANDOFF
1222
BSC SENDS HANDOFF COMPETE MSG TO WWAN MSC
1224
WWAN MSC SENDS MESSAGE TO WLAN MSC THAT MS IS ON CHANNEL WITH WWAN MSC
1226
WLAN MSC SENDS A MESSAGE TO MS THAT IT MAY CLEAR RESOURCES FOR WLAN
1228
MS ACKS WLAN MSC
1230
END
1299

FIG. 12

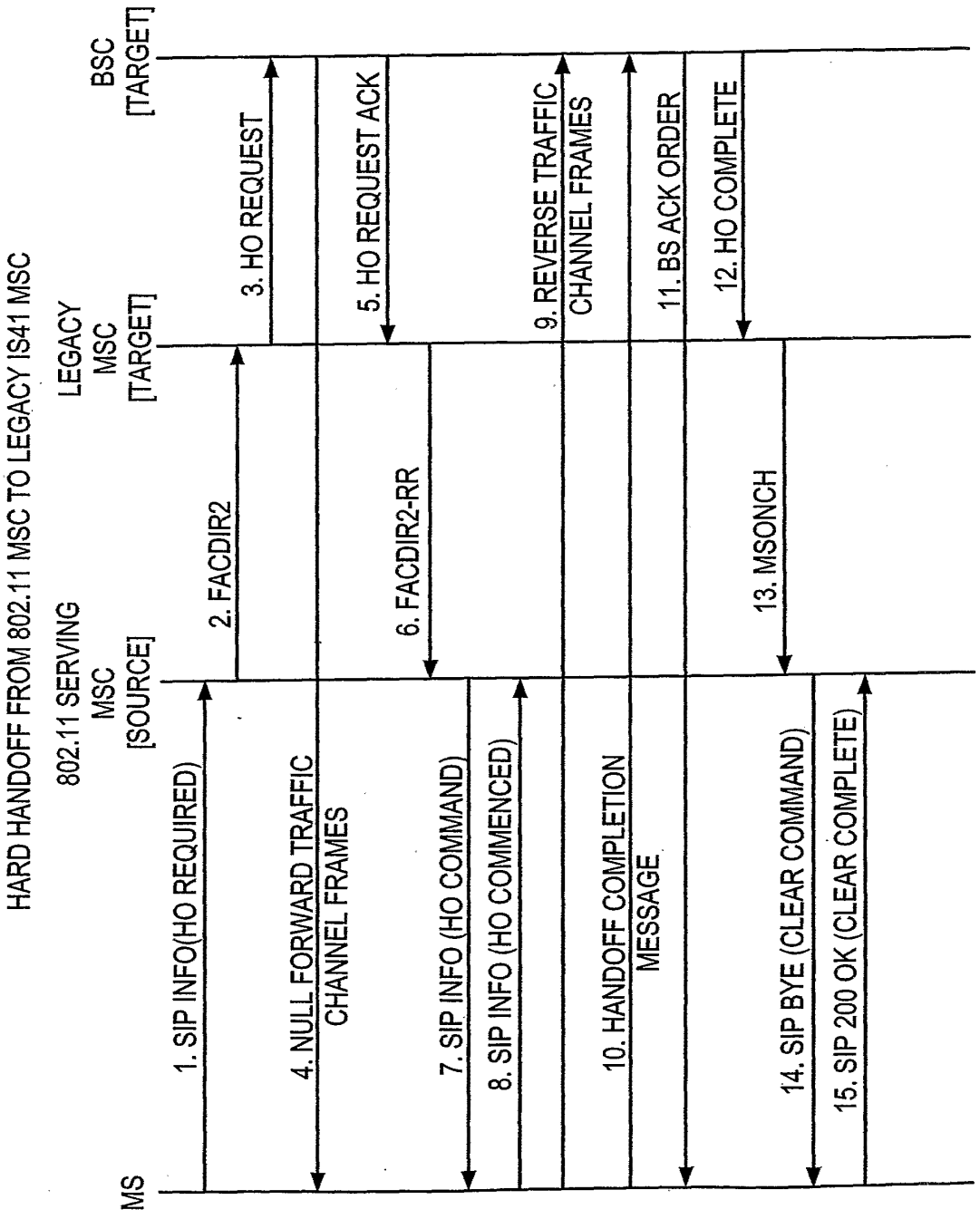

HARD HANDOFF FROM 802.11 MSC TO LEGACY IS41 MSC
MS
802.11 SERVING MSC [SOURCE]
LEGACY MSC [TARGET]
BSC [TARGET]
1. SIP INFO(HO REQUIRED)
2. FACDIR2
3. HO REQUEST
4. NULL FORWARD TRAFFIC CHANNEL FRAMES
5. HO REQUEST ACK
6. FACDIR2-RR
7. SIP INFO (HO COMMAND)
8. SIP INFO (HO COMMENCED)
9. REVERSE TRAFFIC CHANNEL FRAMES
10. HANDOFF COMPLETION MESSAGE
11. BS ACK ORDER
12. HO COMPLETE
13. MSONCH
14. SIP BYE (CLEAR COMMAND)
15. SIP 200 OK (CLEAR COMPLETE)

FIG. 13

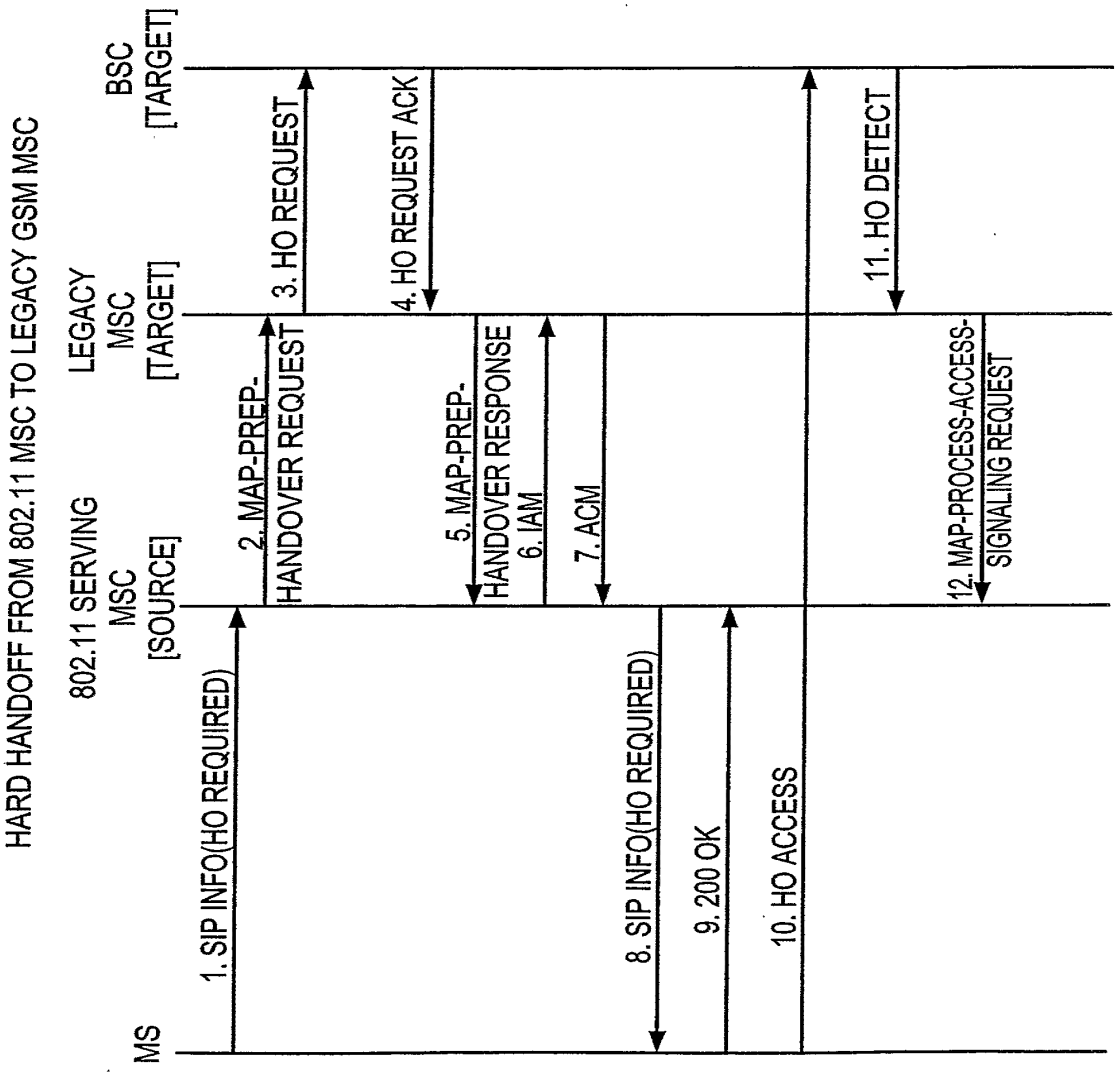


FIG. 14A

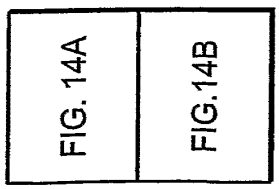


FIG. 14

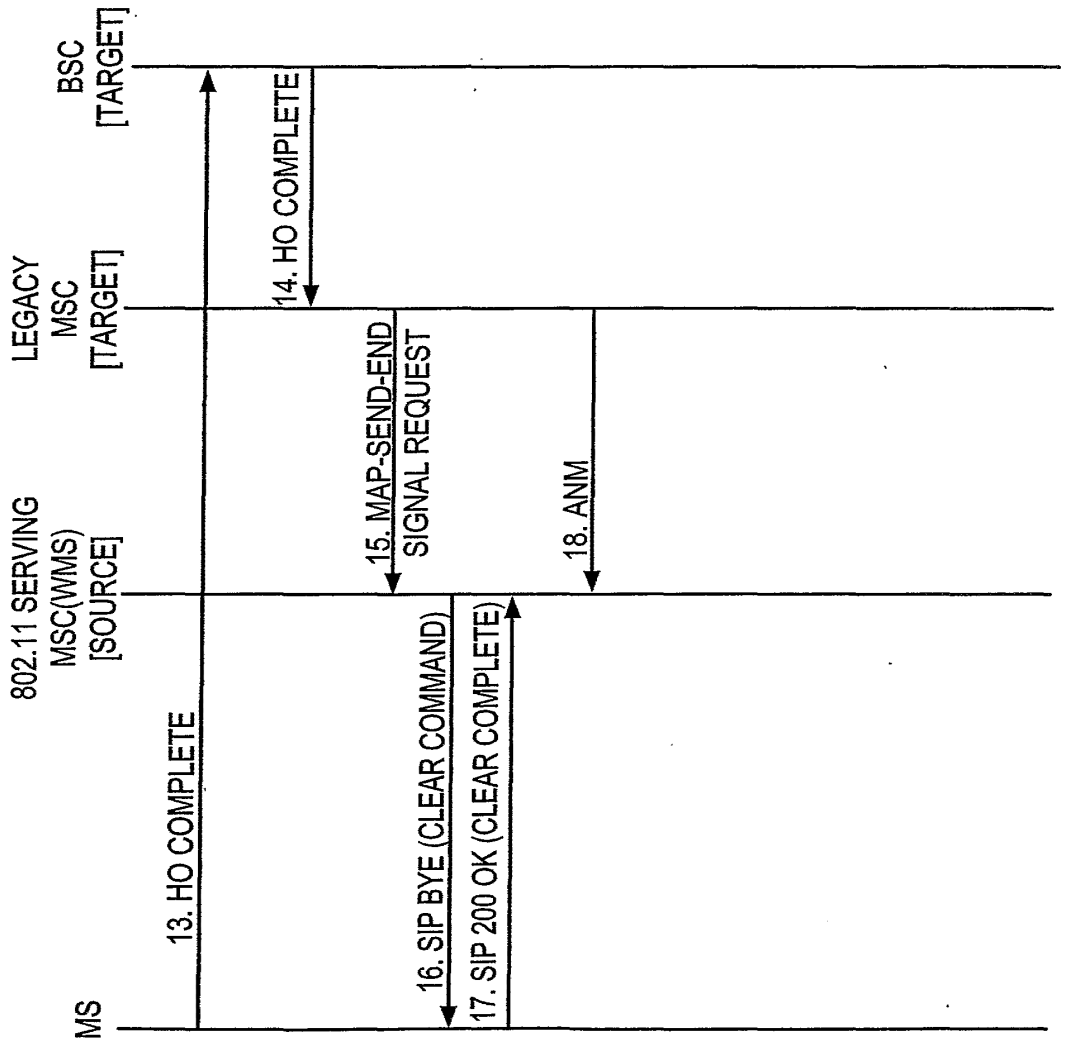

802.11 SERVING MSC(WMS) [SOURCE]
LEGACY MSC [TARGET]
BSC [TARGET]
MS
13. HO COMPLETE
14. HO COMPLETE
15. MAP-SEND-END SIGNAL REQUEST
16. SIP BYE (CLEAR COMMAND)
17. SIP 200 OK (CLEAR COMPLETE)
18. ANM

FIG. 14B

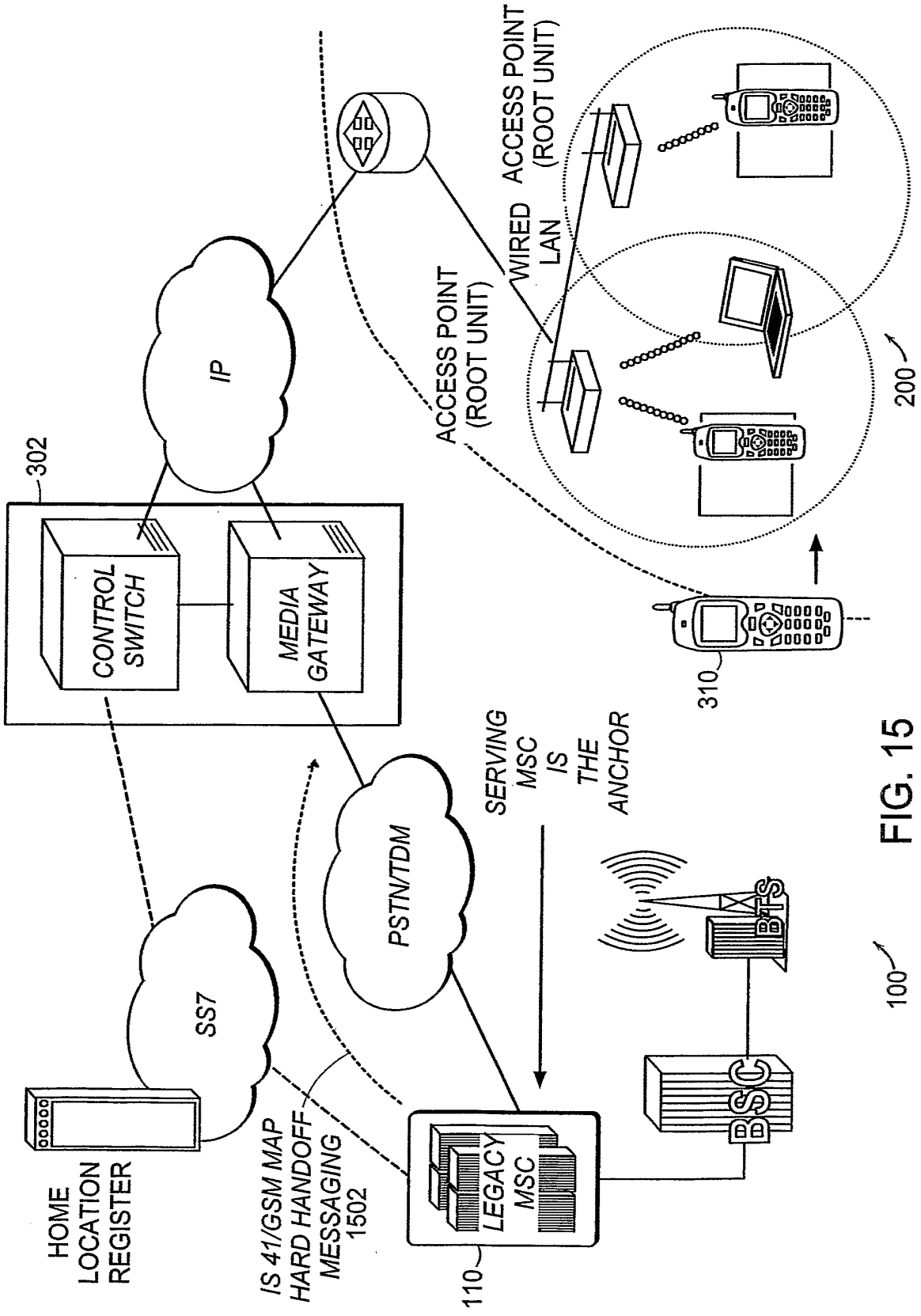

ACCESS POINT (ROOT UNIT)
WIRED LAN
ACCESS POINT (ROOT UNIT)
IP
302
CONTROL SWITCH
MEDIA GATEWAY
200
310
SERVING MSC IS THE ANCHOR
PSTN/TDM
SS7
HOME LOCATION REGISTER
IS 41/GSM MAP HARD HANDOFF MESSAGING 1502
LEGACY MSC
110
BTS
BSC
100

FIG. 15

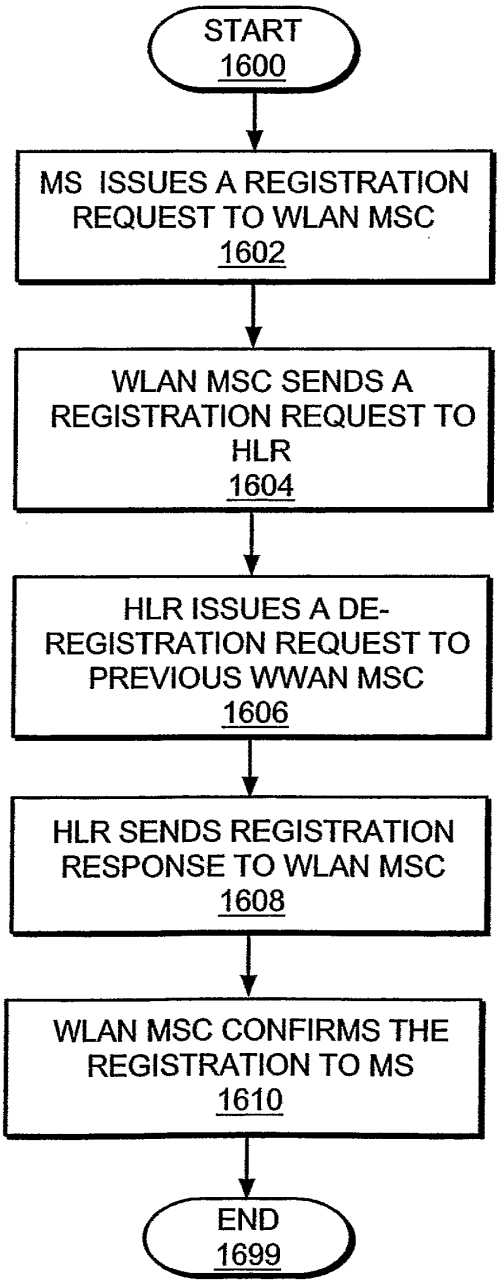

START
1600
MS ISSUES A REGISTRATION REQUEST TO WLAN MSC
1602
WLAN MSC SENDS A REGISTRATION REQUEST TO HLR
1604
HLR ISSUES A DE-REGISTRATION REQUEST TO PREVIOUS WWAN MSC
1606
HLR SENDS REGISTRATION RESPONSE TO WLAN MSC
1608
WLAN MSC CONFIRMS THE REGISTRATION TO MS
1610
END
1699

FIG. 16

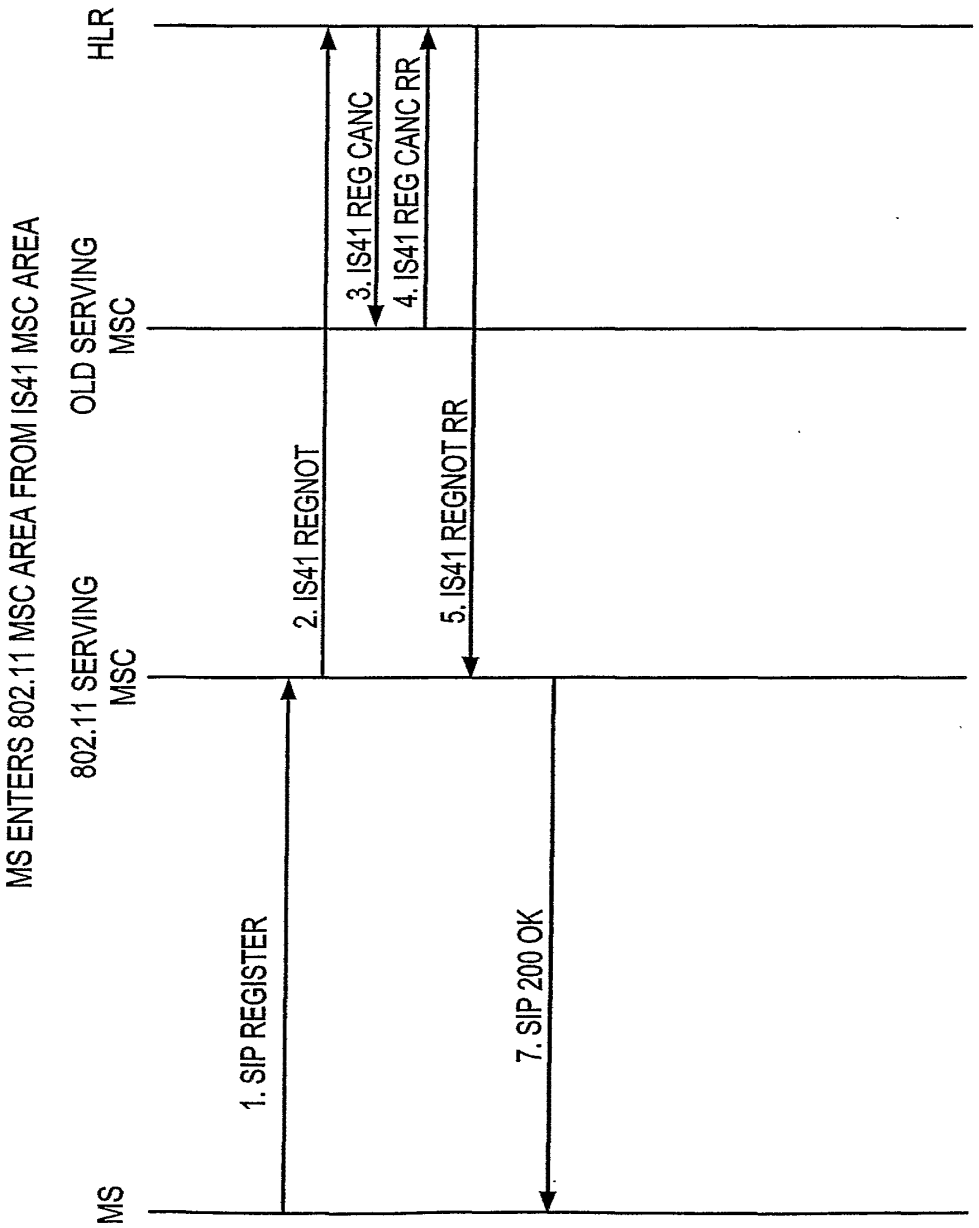

MS ENTERS 802.11 MSC AREA FROM IS41 MSC AREA
MS
802.11 SERVING MSC
OLD SERVING MSC
HLR
1. SIP REGISTER
2. IS41 REGNOT
3. IS41 REG CANC
4. IS41 REG CANC RR
5. IS41 REGNOT RR
7. SIP 200 OK

FIG. 17

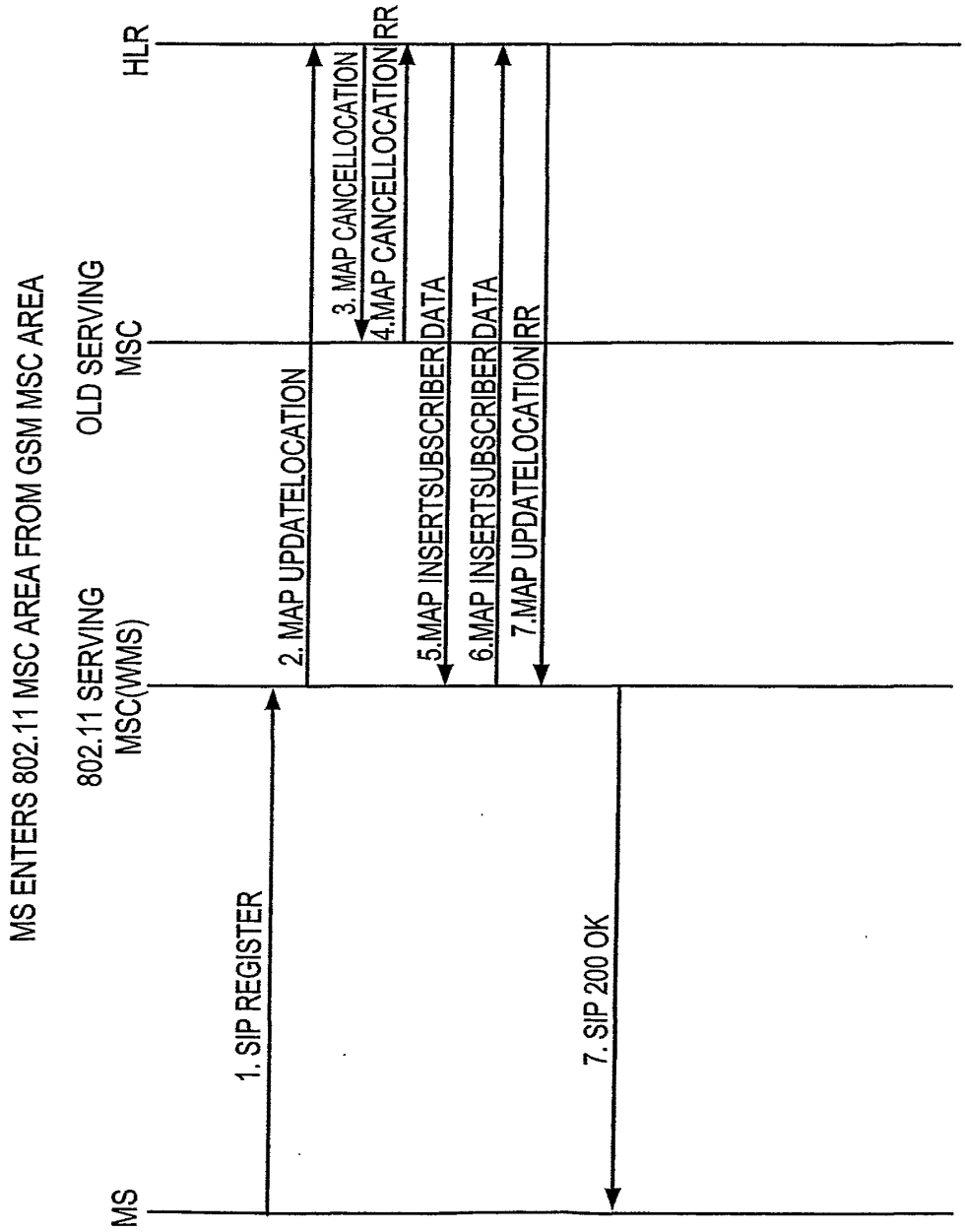

MS ENTERS 802.11 MSC AREA FROM GSM MSC AREA
802.11 SERVING MSC(WMS)
OLD SERVING MSC
HLR
MS
1. SIP REGISTER
2. MAP UPDATELOCATION
3. MAP CANCELLOCATION
4.MAP CANCELLOCATION RR
5.MAP INSERTSUBSCRIBER DATA
6.MAP INSERTSUBSCRIBER DATA
7.MAP UPDATELOCATION RR
7. SIP 200 OK

FIG. 18

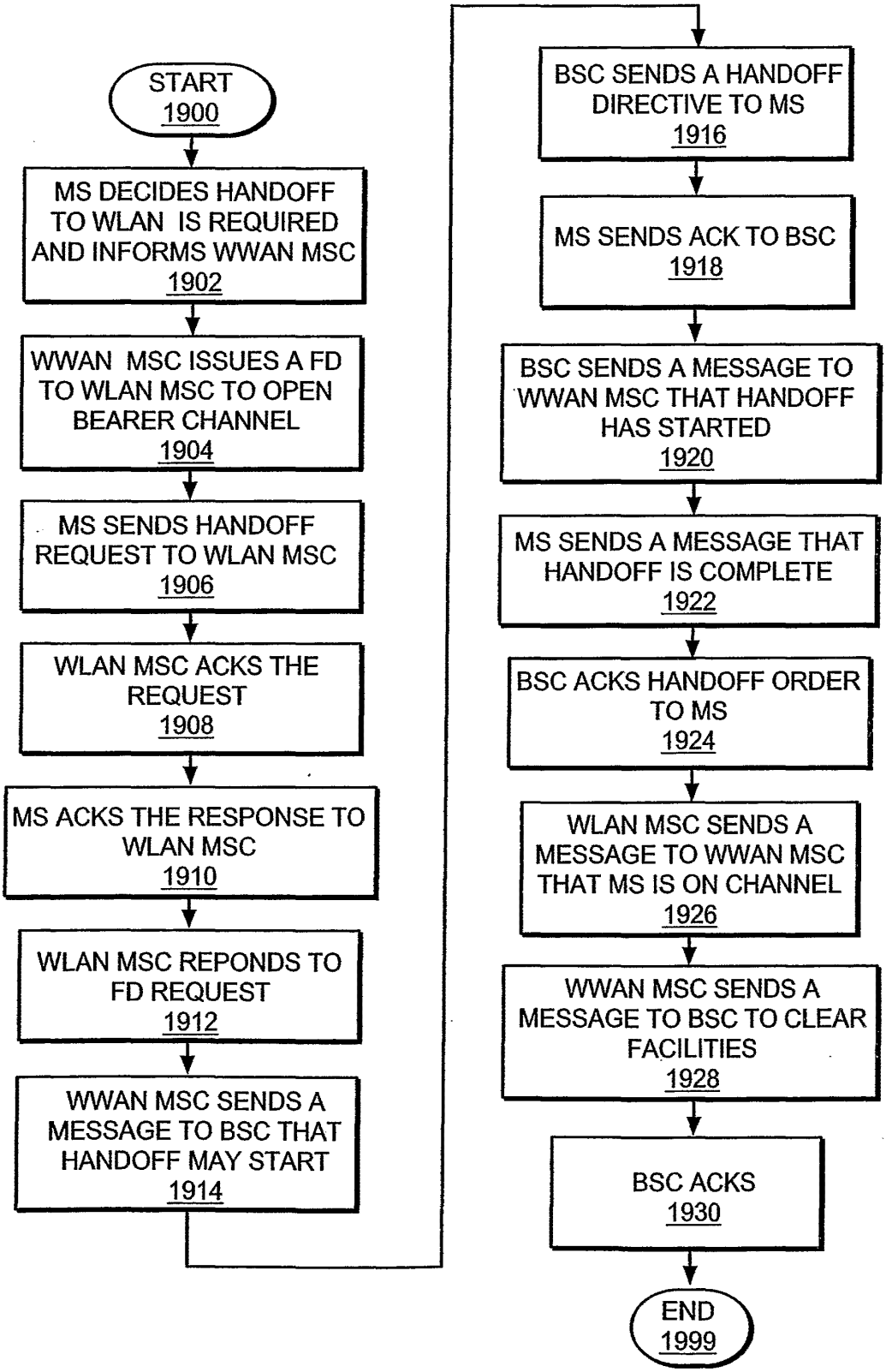

START
1900
MS DECIDES HANDOFF TO WLAN IS REQUIRED AND INFORMS WWAN MSC
1902
WWAN MSC ISSUES A FD TO WLAN MSC TO OPEN BEARER CHANNEL
1904
MS SENDS HANDOFF REQUEST TO WLAN MSC
1906
WLAN MSC ACKS THE REQUEST
1908
MS ACKS THE RESPONSE TO WLAN MSC
1910
WLAN MSC REPONDS TO FD REQUEST
1912
WWAN MSC SENDS A MESSAGE TO BSC THAT HANDOFF MAY START
1914
BSC SENDS A HANDOFF DIRECTIVE TO MS
1916
MS SENDS ACK TO BSC
1918
BSC SENDS A MESSAGE TO WWAN MSC THAT HANDOFF HAS STARTED
1920
MS SENDS A MESSAGE THAT HANDOFF IS COMPLETE
1922
BSC ACKS HANDOFF ORDER TO MS
1924
WLAN MSC SENDS A MESSAGE TO WWAN MSC THAT MS IS ON CHANNEL
1926
WWAN MSC SENDS A MESSAGE TO BSC TO CLEAR FACILITIES
1928
BSC ACKS
1930
END
1999

FIG. 19

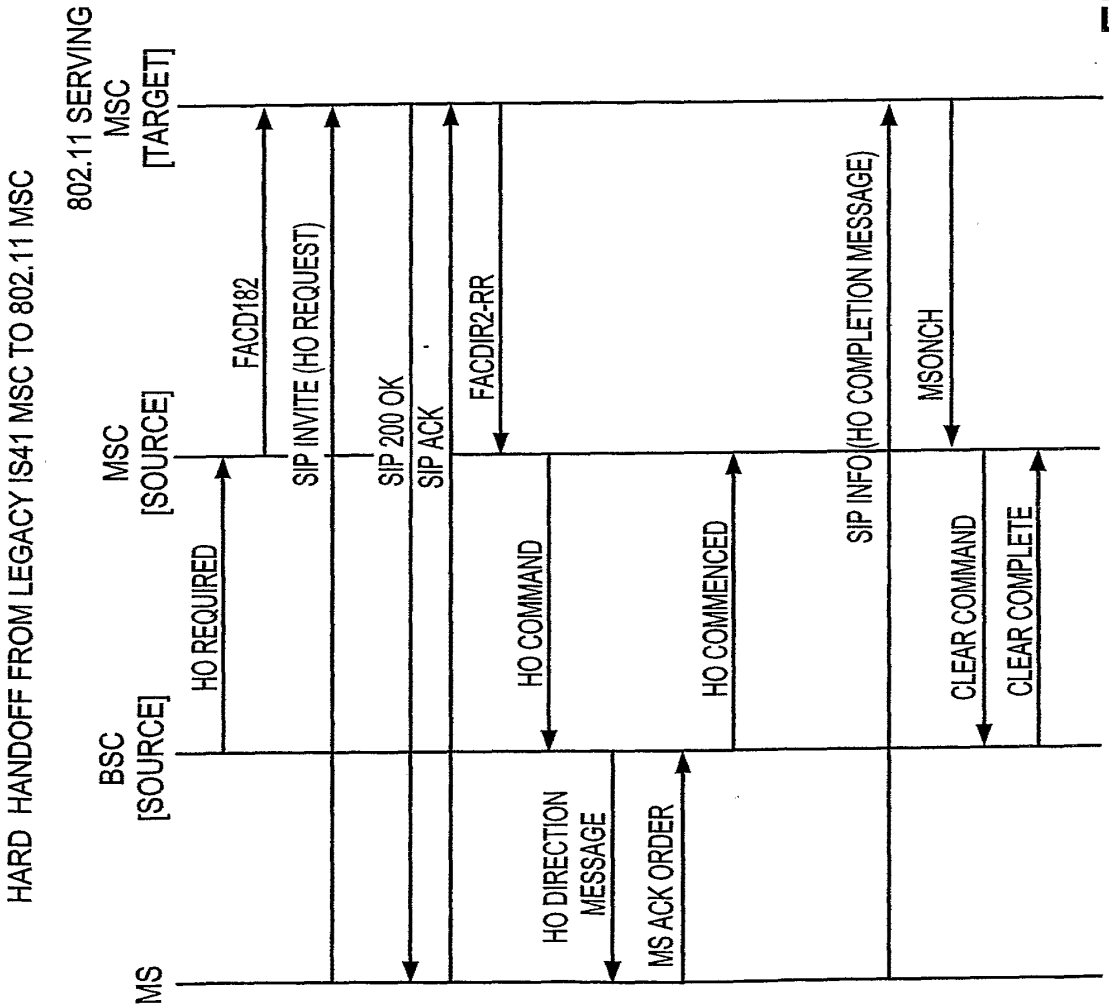

HARD HANDOFF FROM LEGACY IS41 MSC TO 802.11 MSC
MS
BSC [SOURCE]
MSC [SOURCE]
802.11 SERVING MSC [TARGET]
HO REQUIRED
FACD182
SIP INVITE (HO REQUEST)
SIP 200 OK
SIP ACK
FACDIR2-RR
HO COMMAND
HO DIRECTION MESSAGE
MS ACK ORDER
HO COMMENCED
SIP INFO(HO COMPLETION MESSAGE)
MSONCH
CLEAR COMMAND
CLEAR COMPLETE

FIG. 20

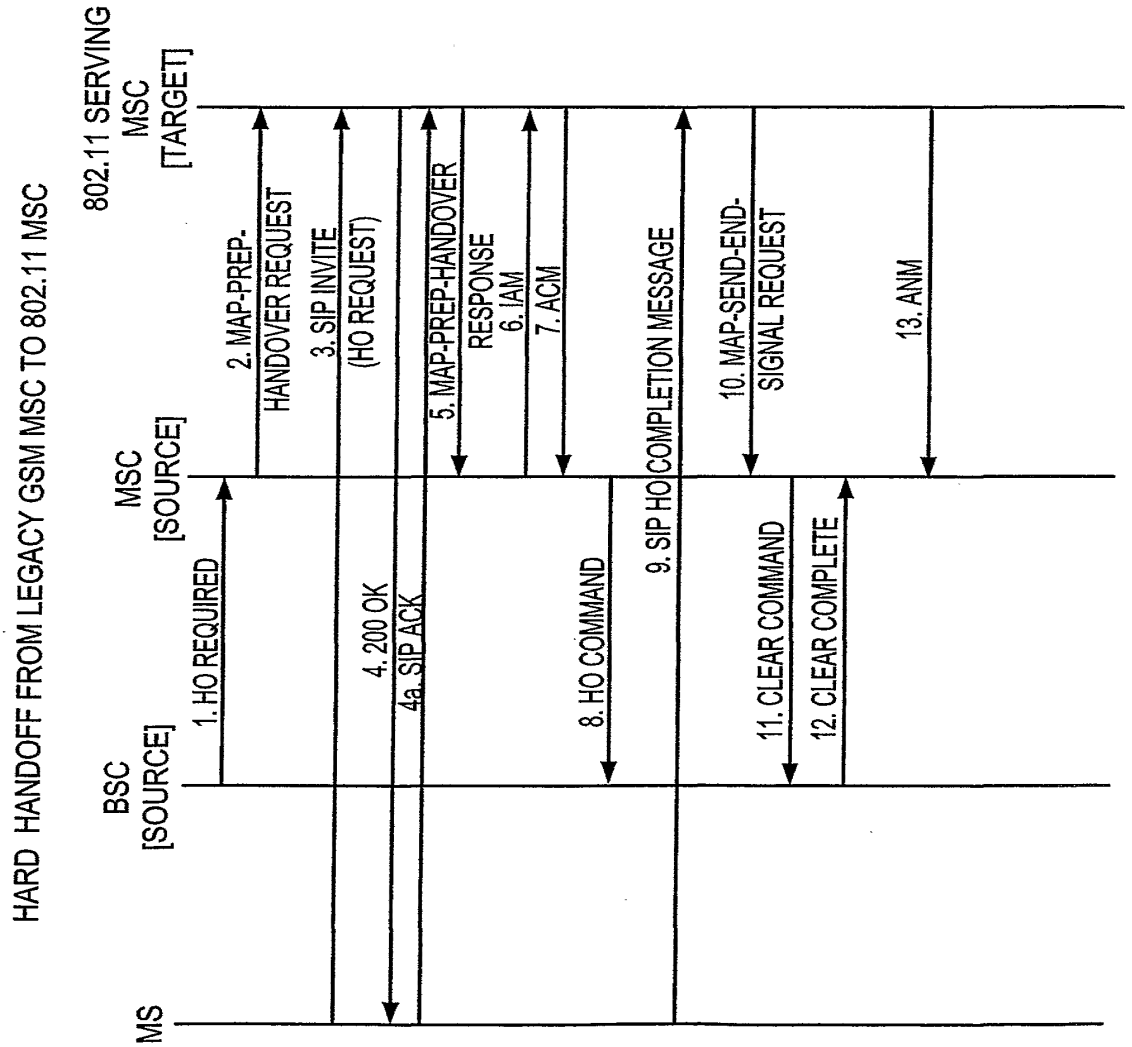

HARD HANDOFF FROM LEGACY GSM MSC TO 802.11 MSC
MS
BSC [SOURCE]
MSC [SOURCE]
802.11 SERVING MSC [TARGET]
1. HO REQUIRED
2. MAP-PREP-HANDOVER REQUEST
3. SIP INVITE (HO REQUEST)
4. 200 OK
4a. SIP ACK
5. MAP-PREP-HANDOVER RESPONSE
6. IAM
7. ACM
8. HO COMMAND
9. SIP HO COMPLETION MESSAGE
10. MAP-SEND-END-SIGNAL REQUEST
11. CLEAR COMMAND
12. CLEAR COMPLETE
13. ANM

FIG. 21

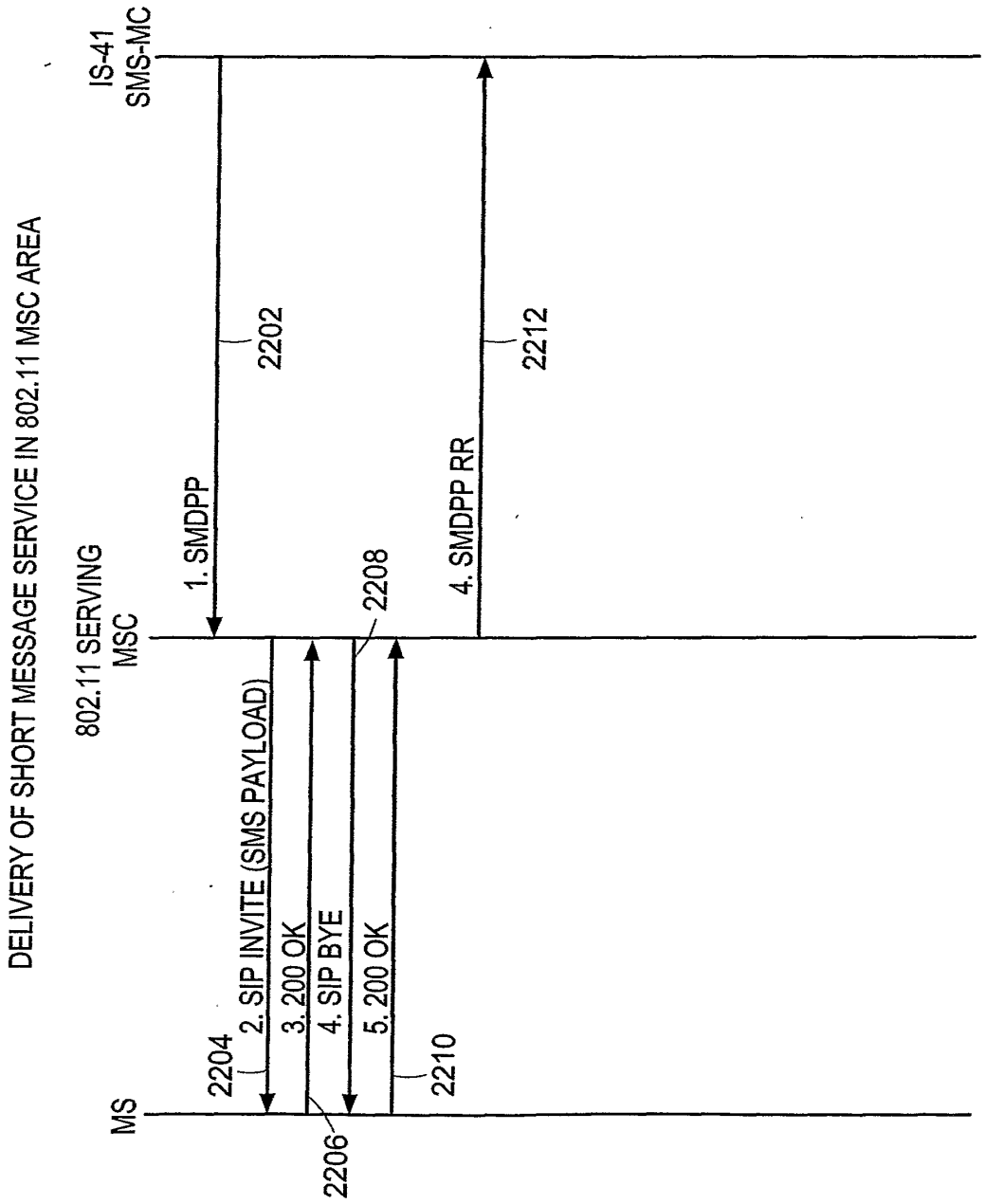

DELIVERY OF SHORT MESSAGE SERVICE IN 802.11 MSC AREA
IS-41 SMS-MC
802.11 SERVING MSC
MS
1. SMDPP
2202
4. SMDPP RR
2212
2208
2. SIP INVITE (SMS PAYLOAD)
2204
3. 200 OK
2206
4. SIP BYE
5. 200 OK
2210

FIG. 22

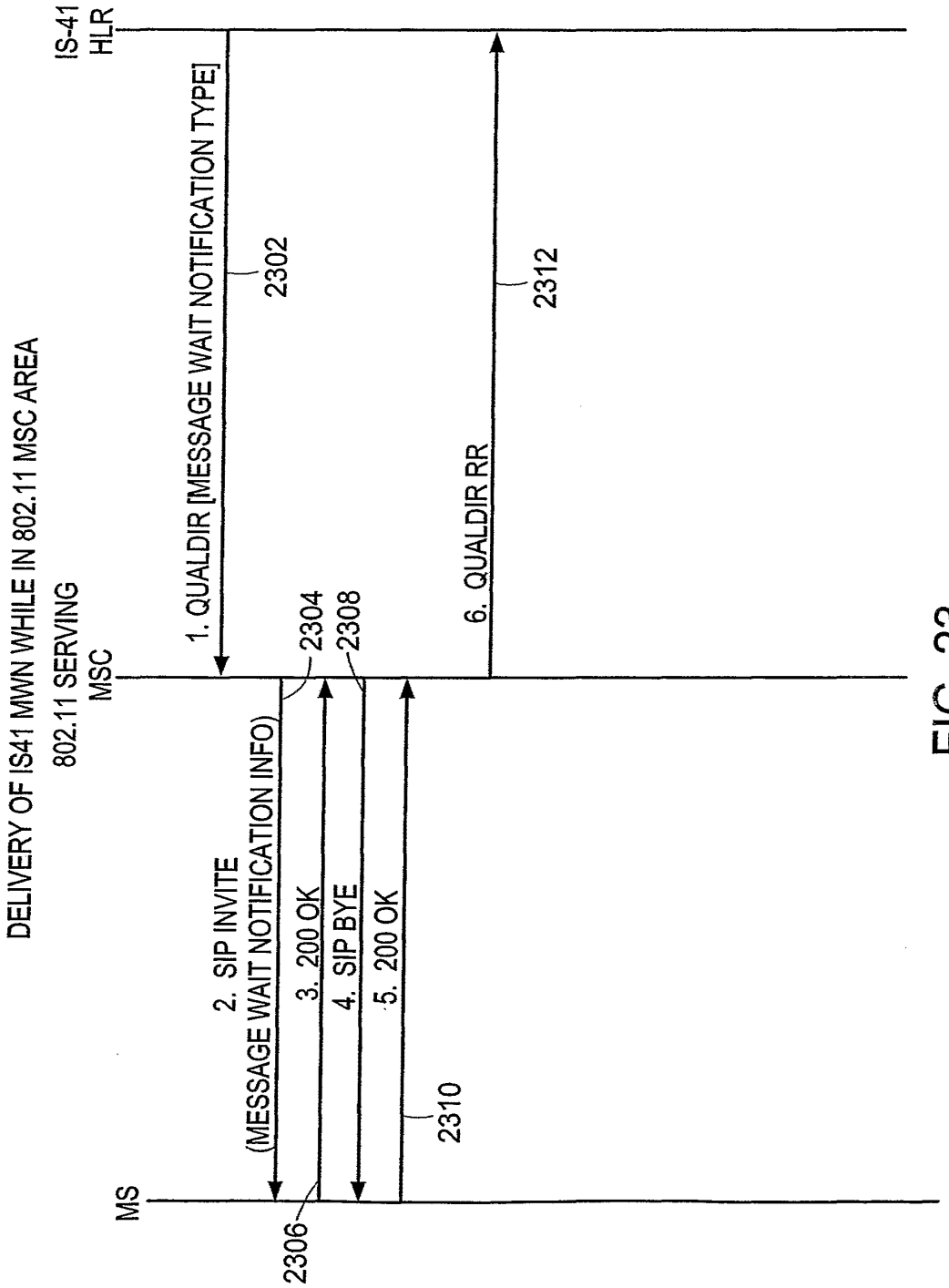

DELIVERY OF IS41 MWN WHILE IN 802.11 MSC AREA
IS-41 HLR
802.11 SERVING MSC
MS
1. QUALDIR [MESSAGE WAIT NOTIFICATION TYPE]
2. SIP INVITE (MESSAGE WAIT NOTIFICATION INFO)
3. 200 OK
4. SIP BYE
5. 200 OK
6. QUALDIR RR
2302
2304
2306
2308
2310
2312

FIG. 23

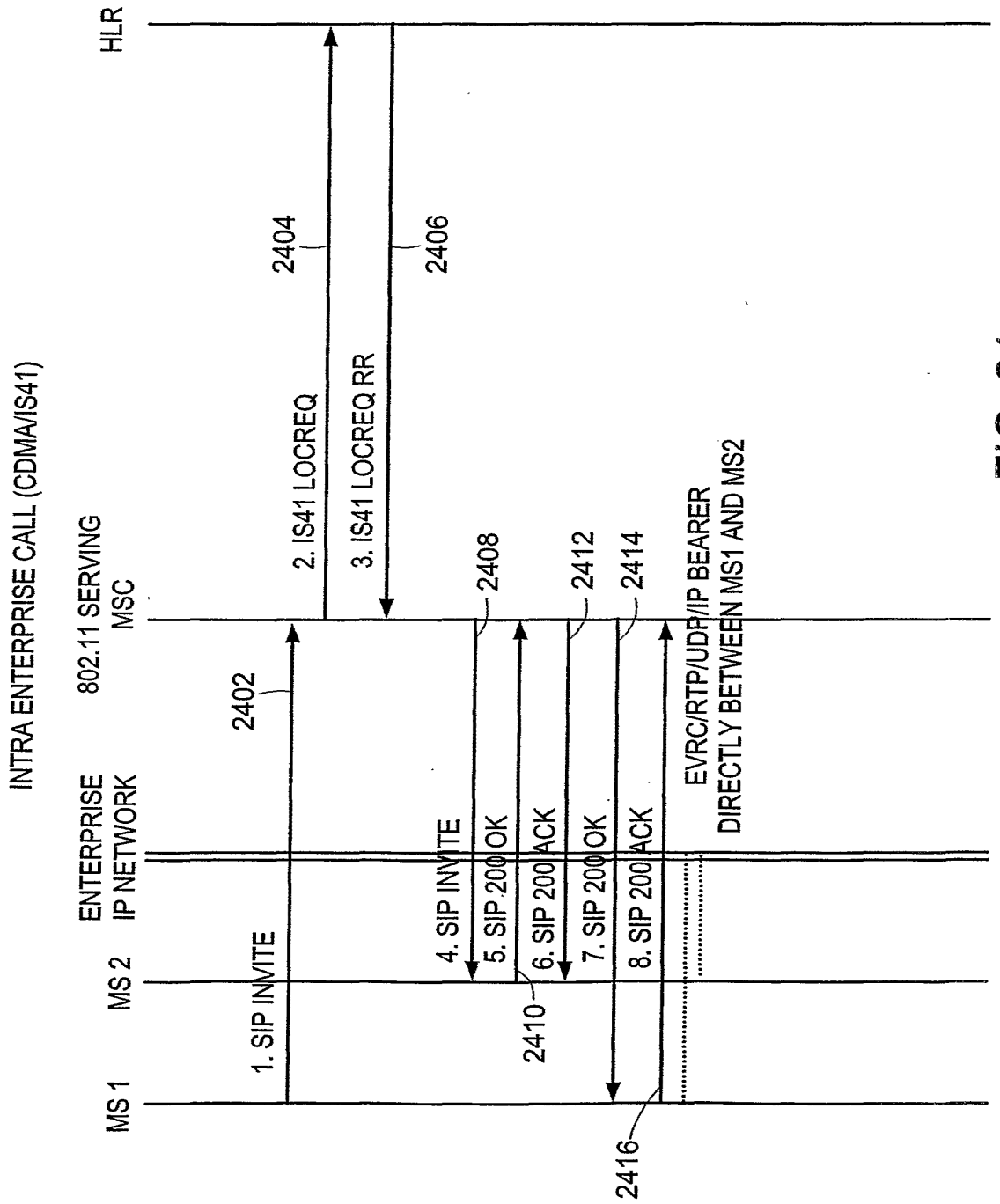

INTRA ENTERPRISE CALL (CDMA/IS41)
MS 1
MS 2
ENTERPRISE IP NETWORK
802.11 SERVING MSC
HLR
1. SIP INVITE
2. IS41 LOCREQ
3. IS41 LOCREQ RR
4. SIP INVITE
5. SIP 200 OK
6. SIP 200 ACK
7. SIP 200 OK
8. SIP 200 ACK
EVRC/RTP/UDP/IP BEARER DIRECTLY BETWEEN MS1 AND MS2
2402
2404
2406
2408
2410
2412
2414
2416

FIG. 24

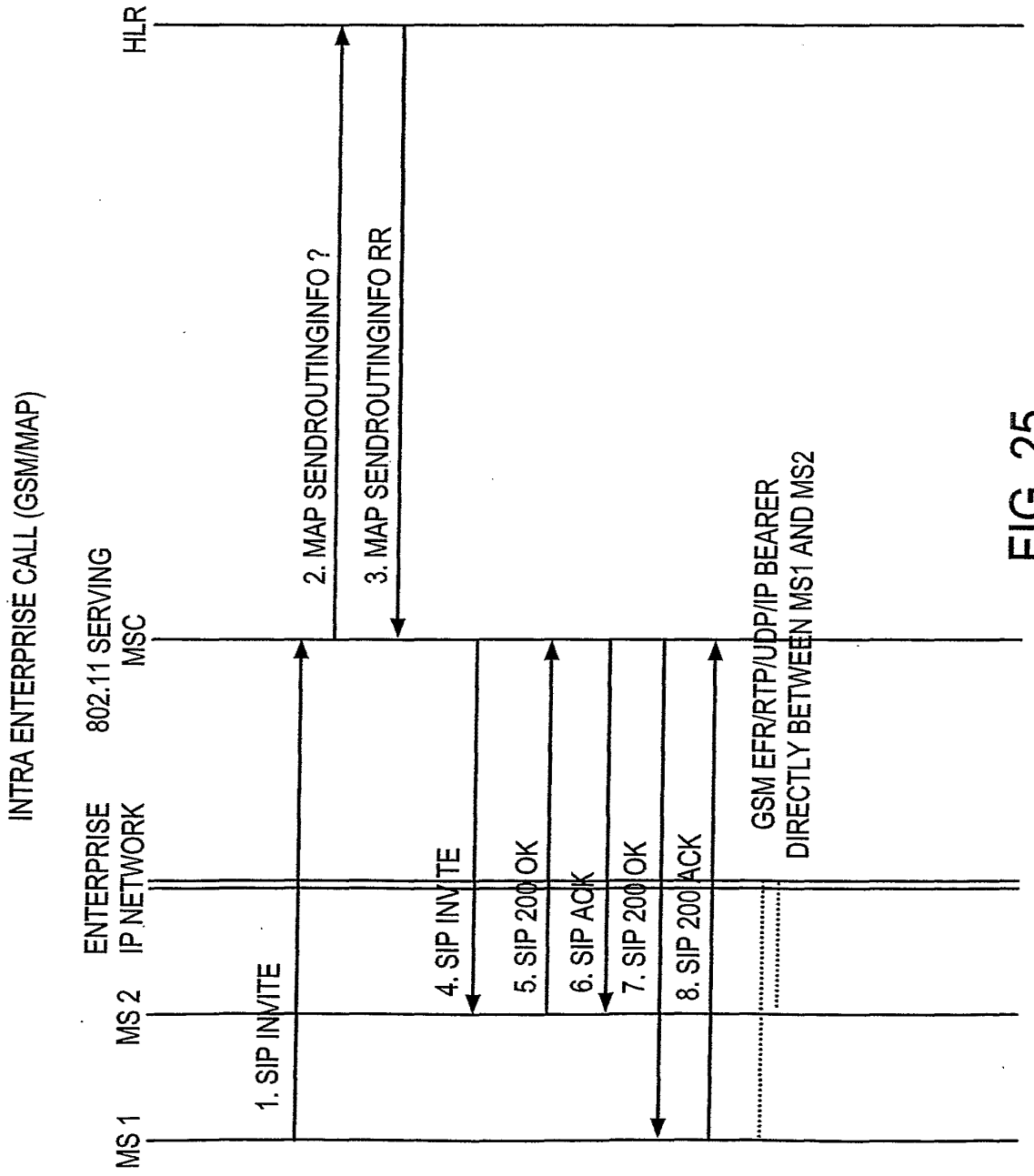

INTRA ENTERPRISE CALL (GSM/MAP)
MS 1
MS 2
ENTERPRISE IP NETWORK
802.11 SERVING MSC
HLR
1. SIP INVITE
2. MAP SENDROUTINGINFO ?
3. MAP SENDROUTINGINFO RR
4. SIP INVITE
5. SIP 200 OK
6. SIP ACK
7. SIP 200 OK
8. SIP 200 ACK
GSM EFR/RTP/UDP/IP BEARER
DIRECTLY BETWEEN MS1 AND MS2

FIG. 25

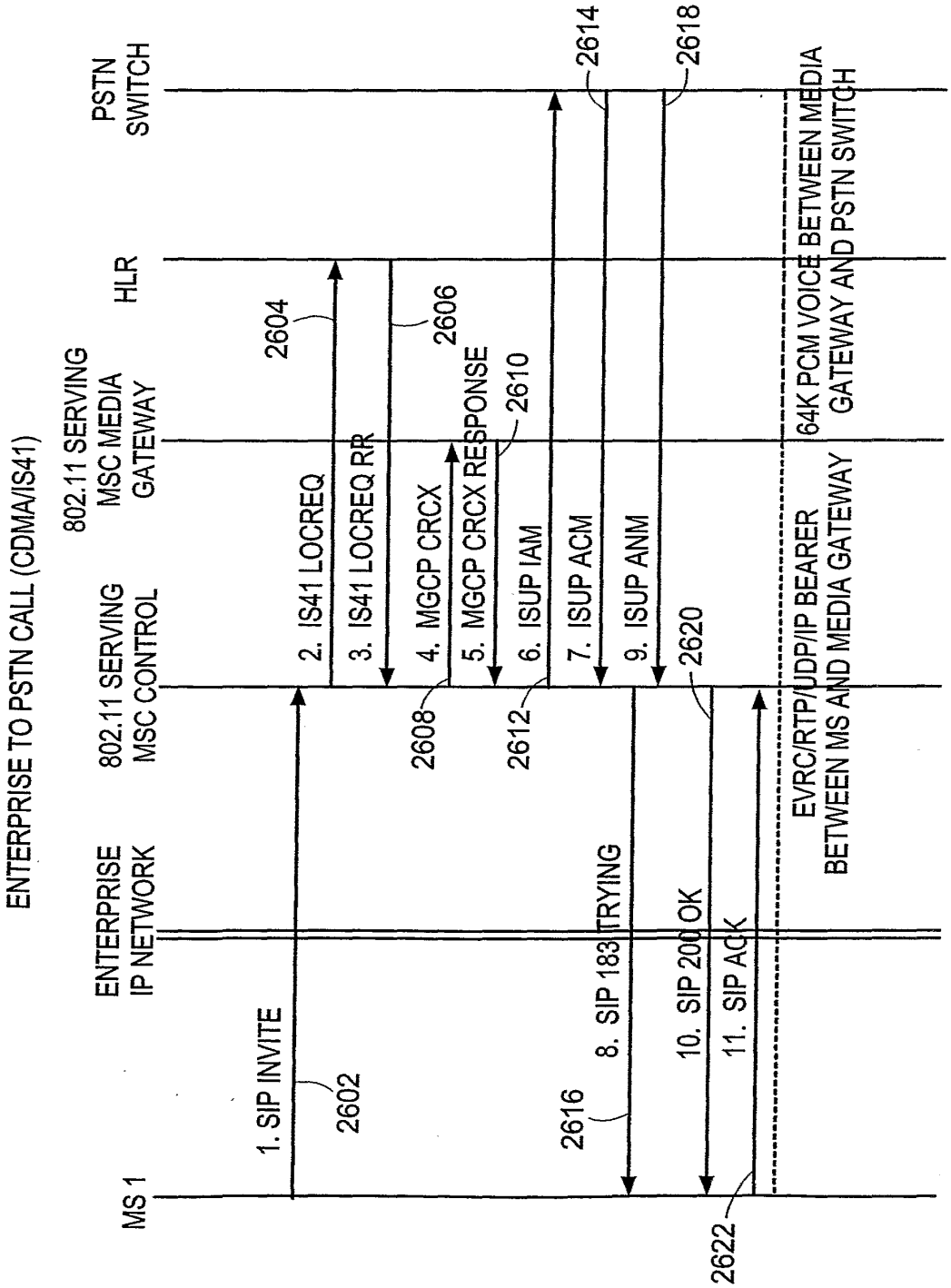

ENTERPRISE TO PSTN CALL (CDMA/IS41)
MS 1
ENTERPRISE IP NETWORK
802.11 SERVING MSC CONTROL
802.11 SERVING MSC MEDIA GATEWAY
HLR
PSTN SWITCH
1. SIP INVITE
2602
2. IS41 LOCREQ
2604
3. IS41 LOCREQ RR
2606
4. MGCP CRCX
2608
5. MGCP CRCX RESPONSE
2610
6. ISUP IAM
2612
7. ISUP ACM
2614
8. SIP 183 TRYING
2616
9. ISUP ANM
2618
10. SIP 200 OK
2620
11. SIP ACK
2622
EVRC/RTP/UDP/IP BEARER BETWEEN MS AND MEDIA GATEWAY
64K PCM VOICE BETWEEN MEDIA GATEWAY AND PSTN SWITCH

FIG. 26

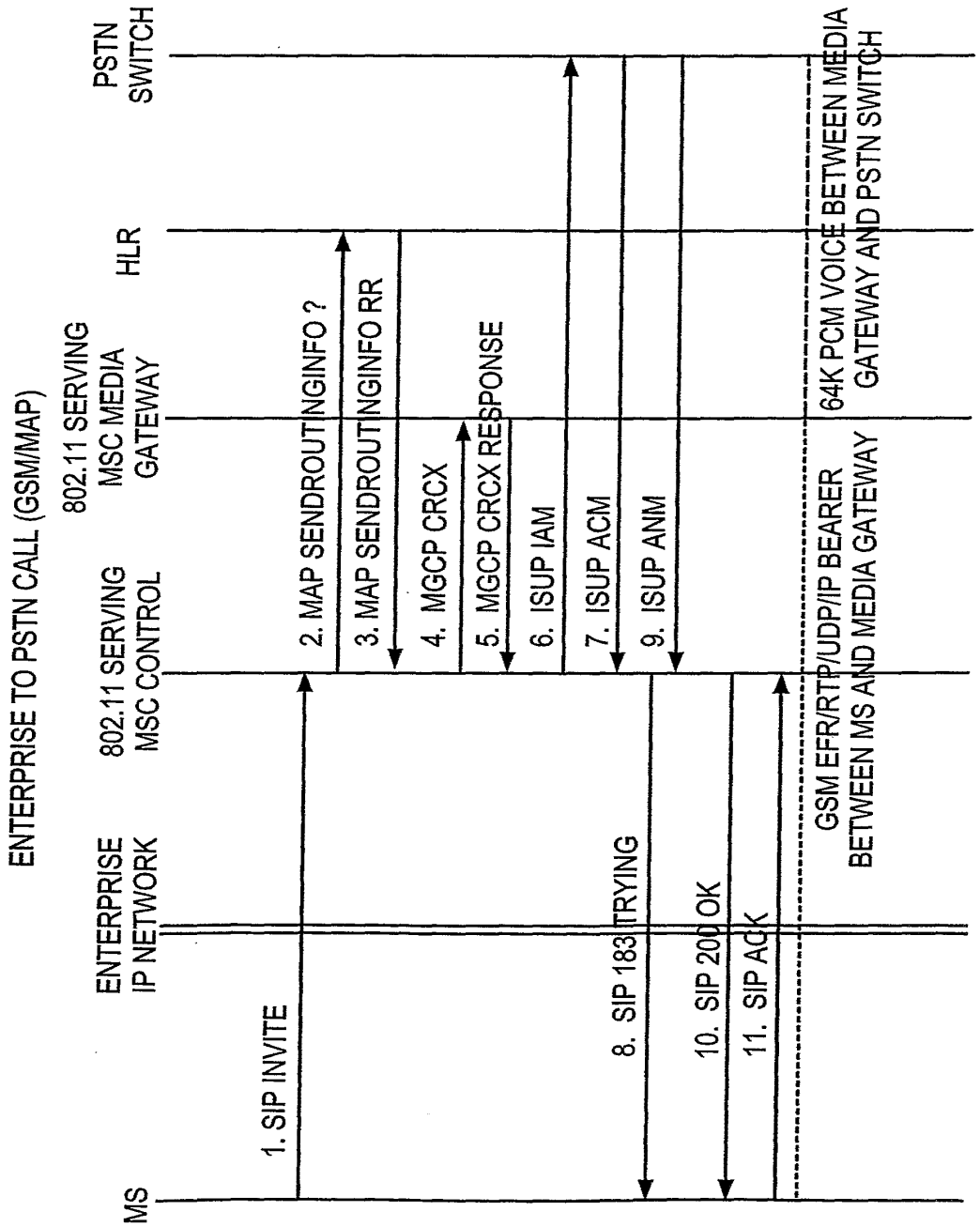

ENTERPRISE TO PSTN CALL (GSM/MAP)
MS
ENTERPRISE IP NETWORK
802.11 SERVING MSC CONTROL
802.11 SERVING MSC MEDIA GATEWAY
HLR
PSTN SWITCH
1. SIP INVITE
2. MAP SENDROUTINGINFO ?
3. MAP SENDROUTINGINFO RR
4. MGCP CRCX
5. MGCP CRCX RESPONSE
6. ISUP IAM
7. ISUP ACM
8. SIP 183 TRYING
9. ISUP ANM
10. SIP 200 OK
11. SIP ACK
GSM EFR/RTP/UDP/IP BEARER BETWEEN MS AND MEDIA GATEWAY
64K PCM VOICE BETWEEN MEDIA GATEWAY AND PSTN SWITCH

FIG. 27

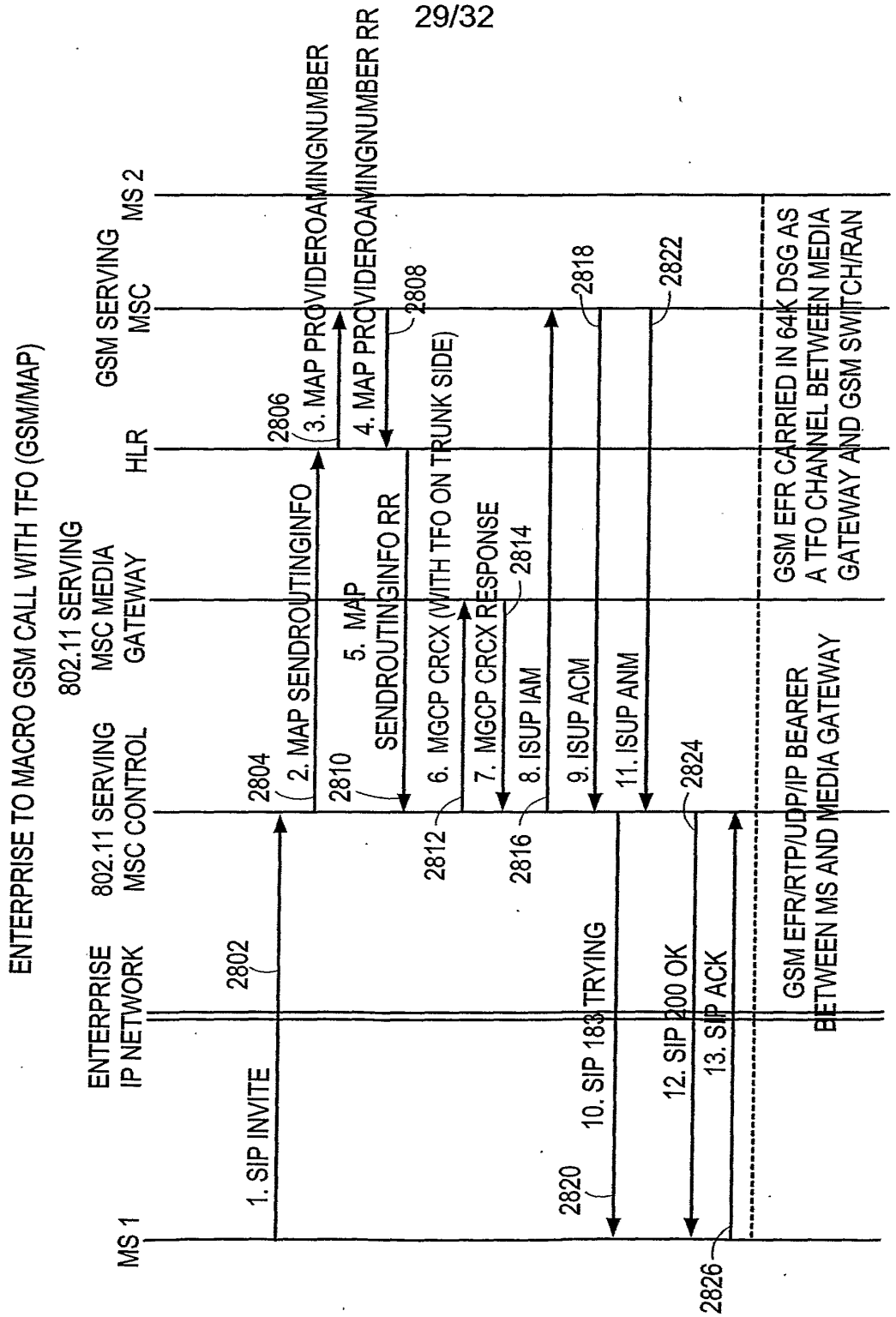

ENTERPRISE TO MACRO GSM CALL WITH TFO (GSM/MAP)
MS 1
ENTERPRISE IP NETWORK
802.11 SERVING MSC CONTROL
802.11 SERVING MSC MEDIA GATEWAY
HLR
GSM SERVING MSC
MS 2
1. SIP INVITE
2802
2804
2. MAP SENDROUTINGINFO
2806
3. MAP PROVIDEROAMINGNUMBER
4. MAP PROVIDEROAMINGNUMBER RR
2808
2810
5. MAP SENDROUTINGINFO RR
2812
6. MGCP CRCX (WITH TFO ON TRUNK SIDE)
2814
7. MGCP CRCX RESPONSE
2816
8. ISUP IAM
2818
9. ISUP ACM
2820
10. SIP 183 TRYING
2822
11. ISUP ANM
2824
12. SIP 200 OK
2826
13. SIP ACK
GSM EFR/RTP/UDP/IP BEARER BETWEEN MS AND MEDIA GATEWAY
GSM EFR CARRIED IN 64K DSG AS A TFO CHANNEL BETWEEN MEDIA GATEWAY AND GSM SWITCH/RAN

FIG. 28

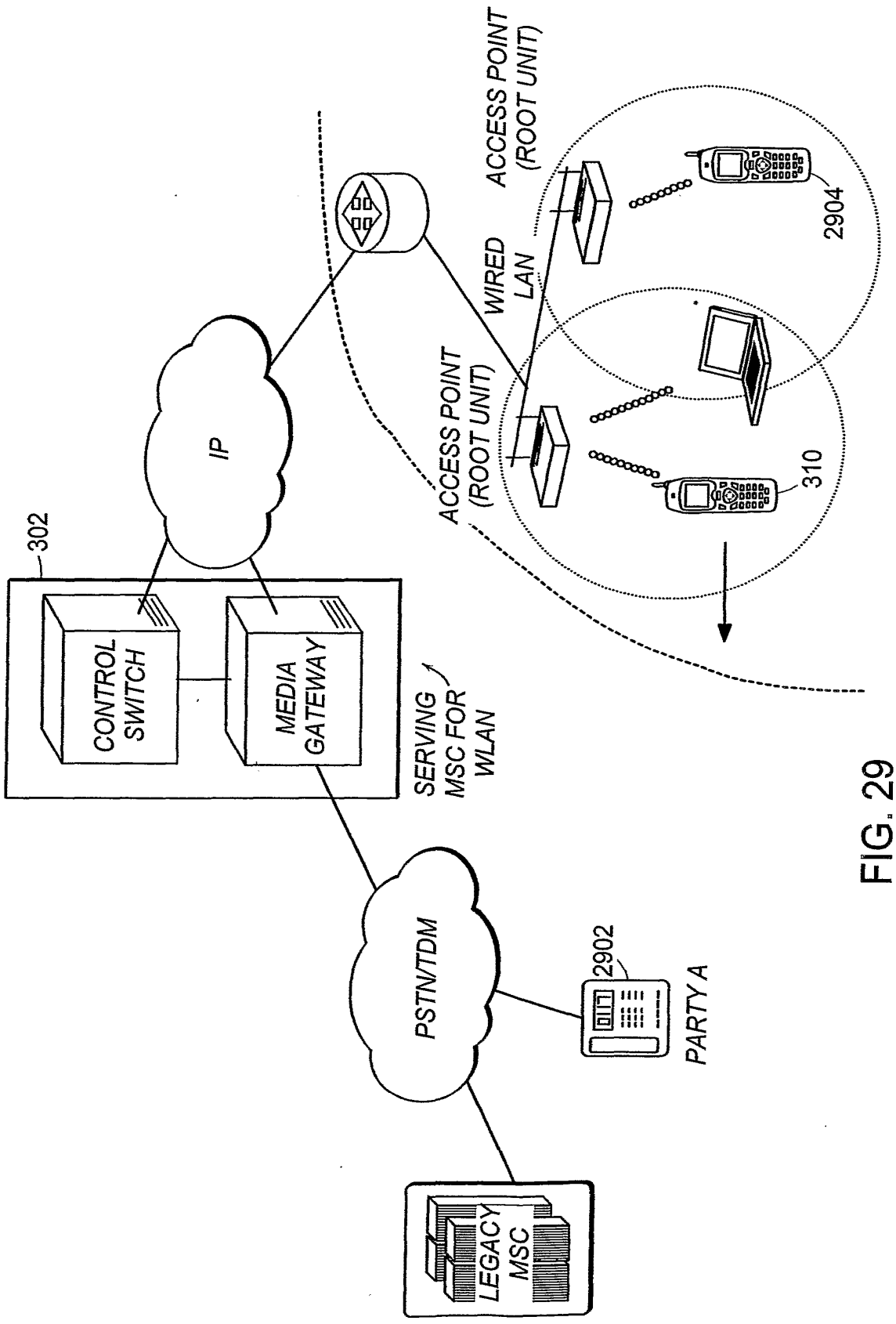

ACCESS POINT (ROOT UNIT)
WIRED LAN
2904
ACCESS POINT (ROOT UNIT)
310
IP
302
CONTROL SWITCH
MEDIA GATEWAY
SERVING MSC FOR WLAN
PSTN/TDM
2902
PARTY A
LEGACY MSC

FIG. 29

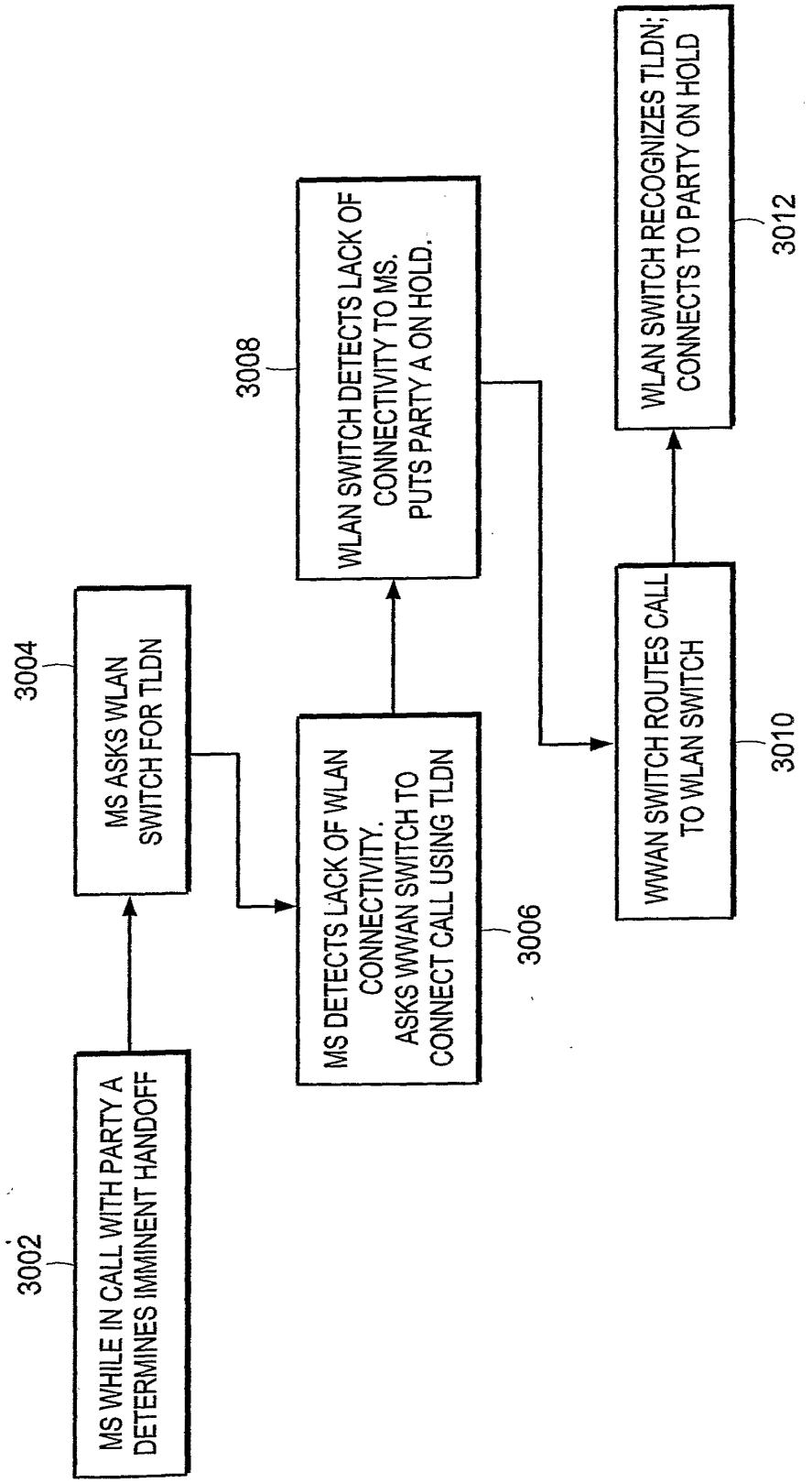

MS WHILE IN CALL WITH PARTY A DETERMINES IMMINENT HANDOFF
3002
MS ASKS WLAN SWITCH FOR TLDN
3004
MS DETECTS LACK OF WLAN CONNECTIVITY. ASKS WWAN SWITCH TO CONNECT CALL USING TLDN
3006
WLAN SWITCH DETECTS LACK OF CONNECTIVITY TO MS. PUTS PARTY A ON HOLD.
3008
WWAN SWITCH ROUTES CALL TO WLAN SWITCH
3010
WLAN SWITCH RECOGNIZES TLDN; CONNECTS TO PARTY ON HOLD
3012

FIG. 30

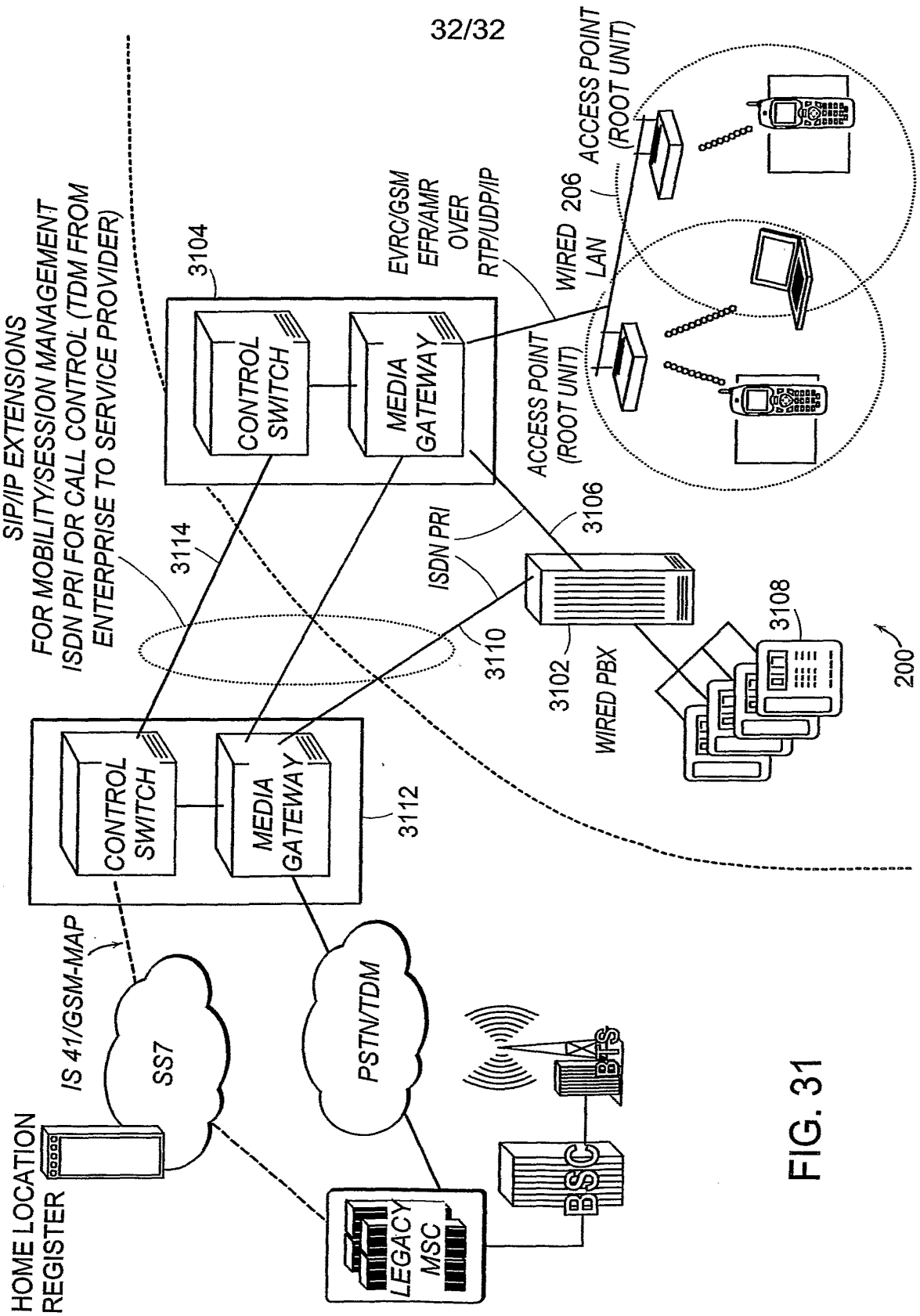

SIP/IP EXTENSIONS
FOR MOBILITY/SESSION MANAGEMENT
ISDN PRI FOR CALL CONTROL (TDM FROM
ENTERPRISE TO SERVICE PROVIDER)
3104
CONTROL SWITCH
MEDIA GATEWAY
EVRC/GSM
EFR/AMR
OVER
RTP/UDP/IP
WIRED LAN
206
ACCESS POINT
(ROOT UNIT)
ACCESS POINT
(ROOT UNIT)
3114
ISDN PRI
3106
3110
3102
WIRED PBX
3108
200
CONTROL SWITCH
MEDIA GATEWAY
3112
IS 41/GSM-MAP
SS7
PSTN/TDM
HOME LOCATION
REGISTER
LEGACY MSC
BSC
BTS

FIG. 31

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10/052,081	17 January 2002 (17.01.2002)	US

(71) Applicant: WINPHORIA NETWORKS, INC. [US/US]; 3 Highwood Drive, Tewksbury, MA 01876 (US).

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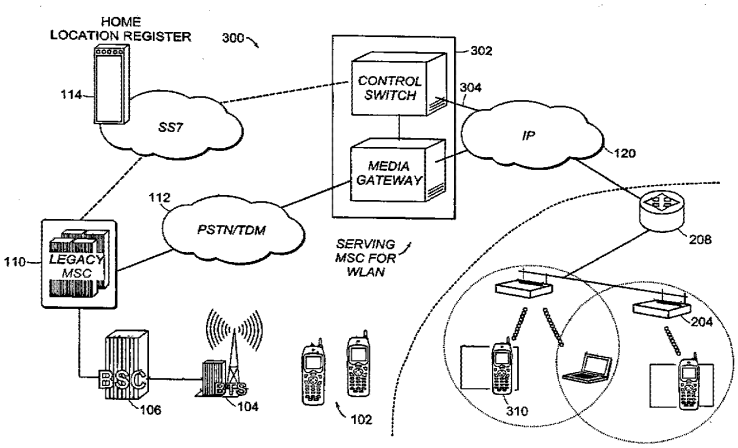
(74) Agent: DICHIARA, Peter, M.; Hale and Dorr LLP, 60 State Street, Boston, MA 02109 (US).

(81) Designated States *(national)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VN, YU, ZA, ZM, ZW.

(84) Designated States *(regional)*: ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD, SYSTEM AND APPARATUS FOR PROVIDING WWAN SERVICES TO A MOBILE STATION SERVICED BY A WLAN



(57) Abstract: A method, system and apparatus for internetworking a WWAN and a WLAN are disclosed. More specifically, a method, system and appparatus for providing WWAN services to a mobile station serviced by a WLAN are disclosed. An MSC (302) is provisioned to serve a WLAN. The MSC (302) that serves the WLAN receives WWAN messages that provide a WWAN service. The MSC (302) forms SIP messages using the received WWAN messages and delivers the SIP messages to the WLAN via an IP link (304). The WLAN delivers the SIP messages to the mobile station via a WLAN air interface protocol. Under one embodiment, the WWAN service is a Short Message Service (SMS). Under another embodiment, the WWAN service is a Message Wait Notification (MWN). Under another embodiment, an MSC (302) that services the WLAN and an MSC (302) servicing the WWAN cooperate to provide TFO call services between an mobile station operating in the WLAN and a mobile station operating in the WWAN.

WO 2003/061177 A3

Published:
— *with international search report*

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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US03/00086

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : H04Q 7/24
US CL : 370/331, 337, 338
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 370/331, 337, 338

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,243,581 B1 (JAWANDA) 05 June 2001 (05. 06. 2001), column 1, lines 25-27, column 2, lines 38-80	1, 2, 3, 19, 20
Y, P	US 6,377,608 B1 (ZYREN) 23 April 2002 (23. 04. 2002), column 1, lines 45-46, column 2, lines 28-40	1, 2, 3, 19, 20
A , P	US 6,486,832 B1 (ABRAMOV et al) 26 November 2002 (26.11.2002), see entire reference.	4- 18, 21-46
A , E	US 6,549,768 B1 (FRACCAROLI) 15 April 2003 (15. 04. 2003), see entire reference.	4-18, 21-46
A , E	US 6,525,648 B1 (KUBLER et al) 25 February 2003 (25. 02. 2003), see entire reference	4-18, 21-46

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
24 May 2003 (24.05.2003)	01 JUL 2003
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer Inder Mehra Telephone No. 703-305-4700

Form PCT/ISA/210 (second sheet) (July 1998)

Electronic Acknowledgement Receipt

EFS ID:	32206462
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	30-MAR-2018
Filing Date:	
Time Stamp:	11:56:43
Application Type:	Utility under 35 USC 111(a)

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_3_30_2018.pdf	615482 54fd5f8ad420b6f9b1c88932bcf61d0369241800	no	13

Warnings:

Information:					
2	Foreign Reference	DE20310113.pdf	948986 83850ce7dc4754b9e8f2b851a81512825701f297	no	14
Warnings:					
Information:					
3	Foreign Reference	EP0936777.pdf	521487 bb52dc332678bf9ac1c80e0adad3191ae1a3995c	no	8
Warnings:					
Information:					
4	Foreign Reference	EP1471665.pdf	1403091 c5c47d1d30bc665f5bd8c9a60a3441e9314b14c1	no	16
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5	Foreign Reference	GB2287858.pdf	1291974 dd3d9cadb64570f5381c841aff66480233cc2210	no	20
Warnings:					
Information:					
6	Foreign Reference	JP200226994.pdf	2923073 176fe27f91bb084fcb6ee9c2a5eee1059cc92404	no	28
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7	Foreign Reference	JP2004320473.pdf	1673925 3452bca343893d9a704470dcd4559d091d3ee516	no	18
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8	Foreign Reference	WO03056719.pdf	1898433 9d23898d2618d3def423d7a9c66424cffa1970b0	no	26
Warnings:					
Information:					

9	Foreign Reference	WO2004013998.pdf	2523267 495e77c232dfbb57f05aa51ff8770575481e9520	no	48
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Information:					
10	Foreign Reference	WO2004057903.pdf	3838484 b0db41c94afdd2f8eaaa4769ac5965a0eafb55df	no	58
Warnings:					
Information:					
11	Foreign Reference	WO2003061177A2.pdf	2842250 c3c3f681715f87ed49f6c9b95dbefff576d56f11	no	71
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Information:					
12	Foreign Reference	WO2003061177A3.pdf	138554 95173c2fcbbc95e9910e21aa43d0335d70bcbda4	no	3
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13	Non Patent Literature	Other1.pdf	1785620 1c96687cc34687470986b95c48013b37e5d97ea9	no	20
Warnings:					
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14	Non Patent Literature	Other2.pdf	4350885 e2f258bbff9bcd38c47c342ead86e5637df45233	no	45
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15	Non Patent Literature	Other3.pdf	2341625 770e4061a9c5decd17e8c9021c24c302c6733047	no	24
Warnings:					
Information:					

16	Non Patent Literature	Other4.pdf	15860457 404a58cf72b033329b9dcfffa34b6517f17f6b62	no	162
Warnings:					
Information:					
			Total Files Size (in bytes):	44957593	

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/921,275	03/14/2018	2642	3285	HAVA-00507	47	8

CONFIRMATION NO. 7190

28960
HAVERSTOCK & OWENS LLP
162 N WOLFE ROAD
SUNNYVALE, CA 94086

FILING RECEIPT



Date Mailed: 04/10/2018

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Vasudevan Ganesan, San Jose, CA;
Stephane H. Maes, Fremont, CA;

Applicant(s)

Vasu Networks Corporation, San Jose, CA;

Assignment For Published Patent Application

Vasu Networks Corporation

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CIP of 15/480,293 04/05/2017
which is a CON of 14/806,482 07/22/2015 PAT 9648538
which is a CON of 13/899,303 05/21/2013 PAT 9125128
which is a CON of 13/168,585 06/24/2011 PAT 8467789
which is a CON of 11/031,498 01/06/2005 PAT 7991399
which claims benefit of 60/534,466 01/06/2004

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/921,275**

Projected Publication Date: 07/19/2018

Non-Publication Request: No

Early Publication Request: No
**** SMALL ENTITY ****
Title

MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

Preliminary Class

455

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 15/921,275

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	75		N/A	
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	330		N/A	
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	380		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	47 minus 20 =	* 27	x 50 =	1350	OR		
INDEPENDENT CLAIMS (37 CFR 1.16(h))	8 minus 3 =	* 5	x 230 =	1150			
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			0.00			
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				0.00			
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	3285		TOTAL	

APPLICATION AS AMENDED - PART II

AMENDMENT A

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

AMENDMENT B

	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
Application Size Fee (37 CFR 1.16(s))									
FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
					TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

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	1	1723719	CN	A	2006-01-18	Motorola Inc		

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	
	Examiner Name	not yet assigned
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	1	Copy of Office Action from Chinese Patent Application No.: 201510039302.4, dated February 8, 2018.	X

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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☒ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-05-03
Name/Print	Jonathan O. Owens	Registration Number	37902

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9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

[19] 中华人民共和国国家知识产权局

[51] Int. Cl.
H04Q 7/20 (2006.01)
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[74] 专利代理机构 中原信达知识产权代理有限责任公司
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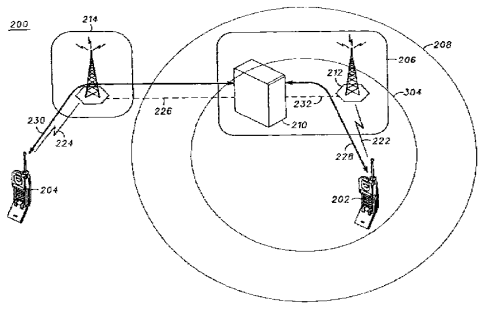
权利要求书 3 页 说明书 17 页 附图 7 页

[54] 发明名称

经媒体网关控制在无线网络之间实现双向软切换的方法和设备

[57] 摘要

本发明提供一种允许移动站在蜂窝网络和无线网络之间切换，而无需来自蜂窝网络的控制介入并独立于所采用的空中接口技术的方法和设备。 更具体的，通过媒体网关(210)连接移动站(202)和远程站(204)之间的呼叫。 该媒体网关经第一连接线连接到移动站并经第二连接线连接到远程站。 然后，接收(520)移动站指向预定号码的通信，或在替代方案中，包括呼叫头部的连接信号被发送到移动站。 然后建立(524)媒体网关和移动站之间的第三连接线，将通信从第一连接线切换(526，528)到第三连接线。



1. 一种用于管理具有覆盖区域的通信网络的方法，所述通信网络和与多个移动站通信的媒体网关相关联，该方法包括以下步骤：

通过所述媒体网关连接移动站和远程站之间的呼叫，所述媒体网关经第一连接线连接到所述移动站，经第二连接线连接到所述远程站；

确定移动站进入所述覆盖区域的过渡区域；

接收移动站的指向预定号码的通信，以建立到所述媒体网关的第三连接线；

在所述媒体网关和移动站之间建立第三连接线；以及

将所述媒体网关和移动站之间的通信从第一连接线切换到第三连接线。

2. 如权利要求 1 的方法，其中，所述到预定号码的通信是指向所述媒体网关的。

3. 如权利要求 1 的方法，进一步包括步骤：命令移动站呼叫所述预定号码，以建立到所述媒体网关的第三连接线。

4. 如权利要求 1 的方法，其中，所述建立第三连接线的步骤是响应接收到指向所述预定号码的通信而发生的。

5. 如权利要求 1 的方法，其中，所述建立第三连接线的步骤是响应接收到指向所述预定号码的通信，并确定在所述媒体网关和移动站之间连接的第一连接线当前正活动而发生的。

6. 如权利要求 1 的方法，其中，所述预定号码是移动站的识别号码和预先分配的切换号码之一。

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7. 如权利要求 1 的方法，其中，所述媒体网关切换媒体网关和移动站之间的通信，无需协调和不同于所述通信网络的另一个网络的呼叫的控制。

8. 如权利要求 1 的方法，在所述切换通信步骤中，第一和第三连接线同时存在，从而所述媒体网关可将媒体网关和移动站之间的通信从第一连接线切换到第三连接线。

9. 如权利要求 1 的方法，其中，第一连接线在非载波网络和载波网络之一内操作，第三连接线在非载波网络和载波网络中的另一个内操作。

10. 一种用于管理具有覆盖区域的通信网络的方法，所述通信网络和与多个移动站通信的媒体网关相关联，该方法包括以下步骤：

通过所述媒体网关连接移动站和远程站之间的呼叫，所述媒体网关经第一连接线连接到所述移动站，经第二连接线连接到所述远程站；

确定移动站进入所述覆盖区域的过渡区域；

发送连接信号到所述移动站以在所述媒体网关和移动站之间建立第三连接线，所述连接信号包括通知移动站将进行从第一连接线到第三连接线的切换的呼叫头部；以及

将所述媒体网关和移动站之间的通信从第一连接线切换到第三连接线。

11. 一种无线通信系统，其包括：

移动站，能和远程站进行通信；

载波网络，用于在载波覆盖区域内允许移动站和远程站之间的无线通信；以及

非载波网络，用于在非载波覆盖区域内允许移动站和远程站之间的无线通信；

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媒体网关，和所述非载波网络相关联，用于连接移动站和远程站之间的呼叫，所述媒体网关能够经载波网络和非载波网络之一和移动站连接第一连接线，接收移动站指向预定号码以建立到所述媒体网关的第二连接线的通信，以及在接收到移动站到预定号码的通信后，经载波网络和非载波网络中的另一个建立和移动站的第二连接线。

12. 如权利要求 11 的方法，其中，所述到预定号码的通信是指向所述媒体网关的。

13. 如权利要求 11 的方法，其中，所述媒体网关进一步能命令移动站呼叫所述预定号码，以建立到媒体网关的第三连接线。

14. 如权利要求 11 的方法，其中，所述媒体网关响应接收到指向所述预定号码的通信而建立第三连接线。

15. 如权利要求 11 的方法，其中，所述媒体网关响应接收到指向所述预定号码的通信，并确定在媒体网关和移动站之间连接的第一连接线当前正活动，而建立第三连接线。

16. 如权利要求 11 的方法，其中，所述预定号码是移动站的识别号码和预先分配的切换号码之一。

17. 如权利要求 11 的方法，其中，所述媒体网关切换媒体网关和移动站之间的通信，无需协调和不同于所述通信网络的另一个网络的呼叫的控制。

18. 如权利要求 11 的方法，其中，第一和第三连接线同时存在，从而所述媒体网关可将媒体网关和移动站之间的通信从第一连接线切换到第三连接线。

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经媒体网关控制在无线网络之间实现双向软切换的方法和设备

技术领域

本发明总的来说涉及移动通信系统，更具体的，涉及在蜂窝网络和另一个无线网络之间实现双向切换而无需蜂窝网络控制干预的设备和方法。

背景技术

在蜂窝电话领域中切换处理是众所周知的。移动用户单元（即移动站）通常通过检测基本收发机站（BTS）发射的某种形式的信标信号连接到蜂窝网络，然后将其自身和该 BTS 同步。在呼叫期间，在移动站和/或基站的移动站和/或网络监测器标准（例如无线信号强度指示（RSSI））确定移动站何时应当切换到另一 BTS。在进行切换的决定中也经常使用和语音质量相关的更复杂的标准，例如误比特率（BER）或帧擦除率（FER）。

使用蜂窝空中接口技术并允许移动站从蜂窝网络移动交换中心（MSC）切换到专用分组交换机（PBX）的覆盖区域的无线网络是已知的。此种类型的网络被采用为在“园区内（on campus）”覆盖提供商务的企业网络。例如，当移动到企业场地的无线覆盖区域时，同时是企业用户的使用 GSM 蜂窝网络的移动通信全球系统（GSM）移动用户，当移动到企业园区的无线覆盖区域时，可以切换到企业 GSM 网络。本地 PBX 功能被用于切换内部呼叫到 PBX 网络，或将外部呼叫切换到公共交换电话网络（PSTN），从而减少了由于本领域公知的外部蜂窝网络切换所强加的企业成本。

移动站在蜂窝网络和结合相同无线接口技术的企业网络之间的切换通常通过协调移动站、蜂窝网络和企业网络的通信以及控制链路实

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现。这些已知的切换方法要求无线网络采用和蜂窝网络相同的无线接口技术，还要求 MSC 和 PBX 例如经 SS7 信令通信。因此，企业用户必须预订特定的蜂窝提供商从而在两个网络中使用相同的移动站。现有的企业网需要使用诸如 SS7 信令的协议和蜂窝网络协调，从而在企业和蜂窝网络之间切换移动站。这些和蜂窝网络协调的要求对企业网络操作员来说负担巨大。首先，蜂窝操作员的空中接口技术限制了企业操作员可在企业中使用的移动站的选择。其次，两个网络之间所需的协调将企业限制到蜂窝操作员，蜂窝操作员用各自提供的服务提供园区内解决方案。

如果移动站能以无缝方式在蜂窝和独立于蜂窝空中接口和控制协调技术的无线网络之间操作，这会有益于企业网络操作员和用户。当它的用户在企业园区内和外都能使用单个移动站时，企业会得益于较高的生产率和成本节约。个人用户会得益于可用于多种目的的单个个人装置，这些目的例如是和工作相关的以及私人通信。当各个企业用户为个人用途使用时，企业用户通常还能不采用相同的蜂窝操作员。通常商业根据成本而被受限于选择提供商。诸如企业和外部网络的未来可用性和互操作性的其他考虑也是商业的考虑事项。在这些方面难以实现两个方面都是最佳的。

此外，如果存在独立于移动站采用的蜂窝技术而使用无线网络的装置，其他服务增强模式或服务增强业务也可以存在。它是蜂窝网络切换控制的一方面，蜂窝网络是实现移动站的此种无缝移动性的限制因素。

因此，需要一种实现蜂窝网络和无线网络之间双向软切换而无需蜂窝网络控制介入的设备和方法。

附图说明

图 1 是显示根据本发明的呼叫建立的框图。

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图 2 是显示根据本发明优选实施例的位于通信网络内的移动站以及和该移动站经一条通信链路通信的媒体网关的框图。

图 3 是显示图 2 的移动站和媒体网关的框图，其中移动站在通信网络边缘迁移，媒体网关正经两条通信链路和移动站通信。

图 4 是显示图 2 和 3 的移动站以及媒体网关的框图，其中该移动站位于通信网络之外，媒体网关经一条通信链路和该移动站通信。

图 5 是显示图 2 到 4 的媒体网关的优选操作的流程图。

图 6 是显示图 2 到 4 的移动站的内部组件的框图。

图 7 是显示图 6 的移动站的优选操作的流程图。

具体实施方式

本发明涉及移动站在两个网络之间实现双向软切换而无需网络之间网络控制介入的方法和设备。更具体的，本发明允许移动站从一个无线网络到另一个无线网络的无缝操作，而不考虑移动站用于无线通信的空中接口技术。

本发明用于移动站在不同网络的控制区域之间移动的情形，例如载波网络和非载波网络。载波网络操作在蜂窝网络上，并通常由包括（但不限于）AT&T Wireless of Redmond, Washington； Cingular Wireless of Atlanta ,Georgia,； Sprint PCS of Overland Park, Kansas; Verizon wireless of New York, New York; 以及 VoiceStream Wireless of Bellevue, Washington 的蜂窝载波控制。载波网络通常采用基于模拟的空中接口和/或一个或多个基于数字的空中接口。基于数字的空中接口使用包括（但不限于）码分多址（CDMA）、时分多址（TDMA）、移动通信全球系统（GSM）、宽带码分多址（WCDMA）、第三代码分多址（CDMA2000）等数字通信技术。非载波网络操作在无线网络上，并通常不由蜂窝载波控制。非载波网络采用基于无线局域网（WLAN）的空中接口，包括（但不限于）由电子和电气工程师协会支持的 IEEE802.11™（诸如无线以太网兼容联盟支持的 Wi-Fi），蓝牙 SIG, Inc. 支持的 Bluetooth™，HomeRF Working Group Inc.支持的 HomeRF 等。

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现在回到附图，其中相同标记表示相同组件，图 1 是显示根据本发明的呼叫建立和切换的图。对于该图示，在第一位置 102 的移动站使用载波网络 104 建立呼叫，并在移动站移到非载波网络的无线覆盖区域（未示出）的第二位置 108 之后将该呼叫切换到非载波网络 106。相似的，在第二位置 108 的移动站可以使用非载波网络 106 建立呼叫，并在移动站移到载波网络 104 的无线覆盖区域（未示出）内的第一位置 102 之后将呼叫切换到载波网络 104。当然，虽然在图 1 中显示了载波网络和非载波网络，本发明还可用于载波网络之间和非载波网络之间的通信。

参考图 1 图示，每个网络包括多个用于和移动站通信的收发机，用于网络间通信的双向通信组件，以及用于在该多个收发机和该双向通信组件之间通信的互操作配置。如图 1 所示，载波网络 104 包括多个基站 110，移动交换中心（MSC）112，以及在基站和 MSC 之间通信的蜂窝接入网络 114；非载波网络 106 包括多个接入点 116，媒体网关 118，以及在接入点和媒体网关之间通信的无线接入网络 120。网络 104，106 经 MSC112 和媒体网关 118 来相互通信。

如上所述，本发明允许移动站不考虑移动站用于无线通信的空中接口技术，在网络之间无缝操作。关键是要理解本发明注意到，站和/或装置之间建立的载荷信道通常通过媒体网关建立，而不管该呼叫是从载波网络发起到非载波网络、从非载波网络发起到载波网络、从非载波网络发起到另一个非载波网络还是从载波网络发起到另一个载波网络。同样，参与该呼叫的一个或多个站和/或装置都被分配和每个网络相关的电话号码，例如一个用于载波网络的号码和另一个用于非载波网络的号码。对于本发明，分配多个号码的移动站能够切换而不考虑呼叫发起人以及呼叫发起网络。

关键一点还在于理解，因为所有的呼叫都通过媒体网关路由，网

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络之间的各个移动站切换都是“断开之前进行”的软切换，而各个切换的控制是由媒体网关实现的，无需载波网络的介入或控制。因此，不需要传统的交换系统使用的 SS7 或其他控制信令来实现本发明的目标。例如，参考图 1，本发明无需在 MSC112 和媒体网关 118 之间传送 SS7 或其他控制信令。

用另一种方式表述，本发明的媒体网关不是将和移动站相关的通信控制切换到载波网络，而是当移动站从一个网络重新定位到另一个网络时媒体网关保持该通信控制。更具体的，当移动站和远程站具有通过媒体网关指向的呼叫时，媒体网关具有到移动站的一个连接和到远程站的另一个连接。在此，媒体网关和移动站之间的连接被称为第一呼叫支路。媒体网关然后建立和移动站的第二呼叫支路，从而第一和第二呼叫支路同时存在，将通信从第一呼叫支路切换到第二呼叫支路，并在切换完成之后断开第一呼叫支路。通过保持和移动站的通信控制，媒体网关能无需载波网络的介入或控制实现切换。

图 2 到 4 表示和远程站 204 通信的移动站 202，它具有相对于通信网络 206 的三个不同位置。更具体的，图 2 显示了位于通信网络 206 内（或更具体的，在该通信网络的通信范围内）的移动站 202，图 3 显示在通信网络 206 边缘 208 迁移的移动站 202，以及图 4 显示了位于通信网络 206 之外（或更具体的，在该通信网络的通信范围之外）的移动站 202。虽然图 2 到 4 显示了远程站 204 在通信网络 206 通信范围或边缘 208 之外，应当理解，远程站的位置不是本发明的限制因素。因此，远程站 204 可位于该通信网络的通信范围或边缘 208 之内，而不会显著改变本发明的功能。正如在此使用的，术语通信网络 206 指的是该网络的组件以及该网络的覆盖区域。

图 2 到 4 显示了移动站 202 相对通信网络 206 迁移的至少两种方式。一种方式是，移动站可在如图 2 所示的通信网络 206 之内开始，移动到如图 3 所示的通信网络的外部边缘 208，并如图 4 所示移动到

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超出该外部边缘。在另一种方式中，移动站可以在如图 4 所示的通信网络 206 之外开始，迁移到如图 3 所示的通信网络的外部边缘 208，并进入如图 2 所示的通信网络内。在两种例子中，远程站 204 可位于通信网络 206 之内或之外。因此，应当理解，本发明的操作顺序不必用附图的顺序编号表示。

参考图 2 到 4，通信网络 206 包括用媒体网关 210 表示的一个或多个媒体网关，以及用接入点 212 表示的一个或多个接入点。虽然通信网络 206 可以是载波网络或非载波网络，对于该优选实施例，该通信网络是非载波网络，例如企业网络。例如，通信网络 206 可以采用蜂窝空中接口，诸如模拟、CDMA、TDMA，GSM、 WCDMA 和 CDMA2000，或可以采用基于 WLAN 的空中接口，诸如 IEEE802.11™、Bluetooth™ 以及 HomeRF。

媒体网关 210 能管理两个或多个站之间的呼叫，而不管该站的位置。例如，对于优选实施例，媒体网关 210 连接到通信网络覆盖区域内的接入点 212，能和位于该覆盖区域内的站 202 通信，并能和位于该覆盖区域之外的站 204 通信。媒体网关 210 能通过经第二网络 214 传送来和在覆盖区域之外的站 204 通信。

第二网络 214 包括一个或多个在媒体网关 210 和远程站 204 之间提供通信的基站，以及通信网络 206 包括一个或多个在媒体网关和移动站 202 之间提供通信的接入点 212。例如，对于优选实施例，接入点 212 具有和移动站 202 的无线连接，具有和媒体网关 210 的有线连接，并将来自移动站的通信转发到媒体网关，反之亦然。虽然在图 2 到 4 中没有显示，第二网络 214 可以包括多个支持组件，特别是管理基站以及提供基站到其他基站或网络的互操作性的组件，例如移动交换中心（MSC）。

参考图 2，移动站 202 能和远程站 204 通过通信网络 206 和第二

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网络 214 来通信，从而形成从移动站到远程站的载荷信道。对于优选实施例，移动站 202 具有到通信网络 206 的第一链路 222，远程站 204 具有到第二网络 214 的第二链路 224，以及该通信和第二网络之间具有有线链路。虽然图 2 所示第二链路 224 为优选实施例提供无线通信，应当理解，远程站 204 和第二网络 214 之间的有线连接也适用于本发明。

移动站 202 通过媒体网关 210 和远程站 204 通信。更具体的，媒体网关 210 通过第一连接线和移动站 202 通信，并通过第二连接线和远程站 204 通信。对于优选实施例，如图 2 所示，仅当移动站 202 进入通信网络 206 时，第二连接线一部分用第二链路 224 表示，第一连接线一部分用第一链路 222 表示。如以下详细讨论的，如果移动站 202 退出通信网络 206，第一链路 222 表示第三连接线。

媒体网关 210 可位于任何位置，只要它能和通信网络 206 以及第二网络 214 通信。对于优选实施例，媒体网关 210 和通信网络 206 在一起并作为其一部分，因此，媒体网关处理地址转换并在通信网络的外部边缘 208 内路由。因此，媒体网关 210 经第一链路 222 和移动站 202 通信，并经第二链路 224 和有线链路 226 与远程站 204 通信。

移动站 202 和远程站 204 之间的呼叫通过载荷信道被路由到媒体网关 210。因此，载荷信道包括从移动站 202 延伸到媒体网关 210 的内部移动线 228，以及从媒体网关 210 延伸到移动站 204 的外部远程线 230，还有内部移动和外部远程线之间通过媒体网关 210 的连接。对于优选实施例，内部移动线 228 通过第一无线连接或链路 222、接入点 212 以及网络内部链路 232 连接媒体网关 210 和移动站 202，外部远程线 230 经有线链路 226、第二网络 214 以及第二无线连接或链路 224 连接媒体网关和远程站。

媒体网关 210 可以从一个站（即呼叫站）接收对另一个站（即被

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呼叫站）的呼叫。例如，移动站 202 试图呼叫远程站 204，反之亦然。当媒体网关 210 接收到来自呼叫站的呼叫时，媒体网关根据呼叫站的电话号码以及电子序列号（ESN）或用户识别模块（SIM）信息查询无缝移动寄存器对应该呼叫站的呼叫方 ID 信息。无缝移动寄存器是驻留在媒体网关 210 内或连接到该媒体网关的远程服务器上的数据库。此外，无缝移动寄存器可在多个无线网络内并行存在。该无缝移动寄存器包含用于各个预订无线网络的站的数据纪录。存储的数据包括 ESN 或 SIM 信息、用户名称以及和每个站相关的所有电话号码。

当接收到呼叫站的用户信息时，媒体网关 210 将呼叫站的网络使用的用户信息翻译为被叫站的网络使用的电话号码和用户名称，并发送该翻译的信息到被叫站。随后在被叫站的显示器上显示呼叫站的呼叫方 ID 信息。

图 3 和图 2 类似，但显示移动站 202 移动到通信网络 206 的过渡区域 302。媒体网关 210 能检测到参与呼叫的移动站 202 进入通信网络 206 覆盖区域的过渡区域 302。过渡区域 302 被定义为覆盖区域的外部边缘 208 和内部边缘 304 之间的区域。外部边缘 208 的位置是根据接入点 212 的通信范围（或多个接入点的通信范围）确定的，内部边缘 304 的位置是根据其到外部边缘的相对距离确定的。如果移动站 202 进入过渡区域 302，媒体网关 210 知道移动站可能进入或退出覆盖区域。通过监测移动站 202 在过渡区域 302 内的活动，特别是相对于外部和内部边缘 208、304，媒体网关 210 能更进一步的知道并确定移动终端会进入或退出覆盖范围的概率。外部和内部边缘 208、304 之间较大距离会比较小距离在确定进入或退出概率时具有更大精确性，但较大距离也需要较多资源来监测边缘之间的较大过渡区域 302。

在图 3 中，通信网络 206，更具体的是媒体网关 210，通过测量接入点 212 感知的移动站无线信号强度，检测出移动站 202 到达外部边缘 208。当该无线信号强度到达第一预定最小阈值时，媒体网关 210

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确定移动站是否会移回接入点 212，从而它的信号改善，或是否从接入点移开，从而为了维护建立的呼叫，和移动站的通信必须被切换到第二网络 214。例如，可以设定计时器来确定移动站 202 是否会返回覆盖区域，从而它的信号改善，或会从覆盖区域移开，从而它必须切换到蜂窝网络。一旦通信网络 206 检测到来自移动站 202 的无线信号强度达到低于第一预定最小阈值的第二预定最小阈值，则开始切换处理。

图 3 代表可能有两种不同情形的优选实施例：（1）第一呼叫上的移动站 202 在退出通信网络 206 之前进入过渡区域 302，以及（2）第一呼叫上的移动站在进入该通信网络之前进入过渡区域。对于第一种情形，媒体网关 210 具有到移动站 202 的第一连接线，即内部移动线 228，并响应检测到移动站已经到达过渡区域 302，尝试建立到该移动站的第三连接线，即外部移动线 306。对于第二种情形，媒体网关 306 具有到移动站 202 的第一连接线，即外部移动线 306，并响应检测到移动站已经到达过渡区域 302，尝试建立到移动站的第三连接线，即内部移动线 228。在两种情形中，媒体网关 210 将第三连接线和第一连接线同步，从而可以实际上无缝的方式实现从一个连接到另一个连接的切换。

对于优选实施例，媒体网关 210 命令移动站 202 发送第二呼叫到媒体网关。作为响应，移动站 202 呼叫预定号码以建立第二呼叫，并因此建立到媒体网关 210 的第三连接线。该预定号码可以是移动站的识别号码，例如它的电话号码或预分配的切换号码，例如指定的免费号码（例如“800”，“888”或“877”）或长途号码（例如“900”）。由于移动站和远程站 202、204 之间的呼叫必须通过媒体网关 210 传送，任何到该预定号码的通信都会被导向该媒体网关。

媒体网关 210 可以响应在命令移动站 202 呼叫该预定号码之后的一段预定时间内接收到导向该预定号码的通信来建立第三连接线。在

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替换方案中，媒体网关可以响应接收到导向该预定号码的通信并确定在媒体网关和移动站 202 之间的内部移动线 228 仍然是活动的来建立第三连接线。作为另一个替换方案，媒体网关 210 可以通过呼叫移动站 202，并经此呼叫通知移动站要进行切换操作来建立第三连接线。例如，媒体网关 210 可将头部消息包括到输出呼叫中，通知移动站 202 媒体网关打算将通信从内部移动线 228 切换到外部移动线 306。

参考图 4，显示移动站 202 在通信网络 206 的外部边缘 208 之外。移动站 202 可以通过退出通信网络 206 或准备进入该通信网络而到达此位置。如果移动站 202 退出该通信网络 206，则先前具有到移动站 202 的第一连接线（即内部移动线 228）（图 3 所示）的媒体网关 210 现在具有到移动站的第三连接线，即外部移动线 306。因此，在建立第三通信线之后，媒体网关 210 必须将通信从第一连接线切换到第三连接线并断开第一通信线。对于第二种情形，则媒体网关当前具有第一连接线，即到移动站 202 的外部移动线 306，并尝试建立到移动站的第三连接线，即内部移动线 228。然后，在第三通信线建立之后，媒体网关 210 将通信从第一连接线切换到第三连接线并断开第一通信线。对于优选实施例，假定移动站 202 保留在通信网络 206 之内一段预定时间，第一通信线被断开。

对于图 4 所示优选实施例，移动站 202 经外部移动线 306 和媒体网关 210 通信，远程站 204 经外部远程线和媒体网关通信。理解本发明的要点在于由媒体网关 210 建立并控制外部移动线 306，即使如图 4 所示的站 202、204 采用第二网络 214。如果站 202、204 经第二网络 214 通信而不导向媒体网关 210，媒体网关 210 就不能控制通信，因此当移动站移进和移出通信网络 206 时，不和第二网络 214 传送诸如 SS7 的通信控制信号就不能切换通信。通过维持和媒体网关 210 的外部移动线 306，当移动站 202 在通信和第二网络 206、214 之间移动时，不和第二网络传送通信控制信号，媒体网关也能以无缝方式交替切换给定呼叫。

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远程站 204 可以预订或不预订通信网络 206。如果远程站 204 没有预订通信网络 206（非预订远程站）但发起了到移动站 202 的呼叫，为了能够切换移动站，仍然必须通过媒体网关 210 建立载荷信道。移动站 202 预订通信和第二网络 206、214，因此它具有操作在通信网络中的通信网络号码，诸如企业号码，以及操作在第二网络中的第二网络号码，诸如蜂窝号码。对于该特定情形，如果非预订远程站 204 呼叫通信网络号码，则通过媒体网关 210 建立载荷信道。因此，媒体网关 210 能切换用于移动站 202 的通信。对于另一种情形，如果非预订远程站 204 呼叫第二网络号码，可直接通过第二网络 214 连接远程站和移动站 202 之间的呼叫。因此，媒体网关 210 不控制该呼叫，也不能切换用于移动站 202 的通信。

例如，参考图 4，远程站 204 不是通信网络 206 的用户，仅是第二网络 214 的用户。虽然远程站 204 可位于通信网络 206 之内或之外，该例中远程站位于通信网络之外。移动站 202 是通信网络 206 和第二网络 214 的用户，因此具有至少两个电话号码。移动站 202 还有存储在媒体网关 210 的无缝移动寄存器数据库内的数据。远程站 204 使用移动站的通信网络号码通过第二网络 214 发起到移动站 202 的呼叫，从而建立第二连接线，即外部远程线 230。媒体网关 210 接收该呼叫，并检索用于移动站 202 的用户信息，特别是移动站的第二网络号码。媒体网关 210 然后使用呼叫重定向，从而通信网络 206 通过第二网络 214 呼叫移动站 202 以建立第一连接线，即外部移动线 306。因为移动站 202 位于通信网络 206 的覆盖区域之外，移动站经第二网络 214 接收该呼叫。

对于该例，移动站 202 的呼叫方识别显示器将会显示远程站 204 的第二网络号码和用户名称，因为在媒体网关 210 内未存储用于该远程站 204 的信息。在替换方案中，移动站 202 的显示器将会显示特定消息，例如“区域之外”。外部远程线 230 由媒体网关 210 在整个呼

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叫中维护，因为远程站 204 不是通信网络 206 的用户，而且关于远程站的信息没有存储在媒体网关的无缝移动寄存器中。同样，此例中的远程站 204 也不能切换通信到通信网络 206。媒体网关 210 维持用于该呼叫的载荷信道，移动站 202 预订通信和第二网络 206、214。因此，移动站 202 可使用在此公开的处理过程在通信和第二网络之间切换通信。

参考和图 2 到 4 有关的图 5，提供显示媒体网关 210 优选操作的流程图 500。在步骤 502 开始操作之后，在步骤 504，移动站 202（MS）或远程站 204（RS）中的任一个尝试呼叫移动站或远程站中的另一个。更具体的，移动站 202 可能尝试呼叫远程站 204 的通信网络号码，或远程站 204 可能尝试呼叫移动站的通信网络号码。无论是移动站 202 还是远程站 204 的对通信网络号码的呼叫尝试都在步骤 506 被发送到媒体网关 210。如上所述，在移动站 202 和远程站 204 之间建立的载荷信道总是通过媒体网关 210 建立。然后，媒体网关 210 在步骤 508 通过媒体网关连接移动站 202 和远程站 204 之间的呼叫。媒体网关 210 经第一连接线（即线 1）连接到移动站 202，媒体网关经第二连接线（即线 2）连接到远程站。如图 2 到 4 所示，第一连接线用内部移动线 228 和外部移动线 306 之一表示，第二连接线用外部远程线 230 表示。

在连接呼叫之后，媒体网关 210 在步骤 510 监测移动站 202 相对于覆盖区域的过渡区域 302 的位置。如果当监测移动站 202 位置时，媒体网关 210 在步骤 512 确定终止该呼叫，则操作在步骤 534 结束。否则，如果移动站在步骤 514 没有进入覆盖区域的过渡区域 302，或在步骤 516 移动站将要进入或退出覆盖区域，媒体网关 210 在步骤 510 继续监测移动站 202 的位置。如果到达步骤 512 时呼叫还没有结束，移动站 202 在步骤 514 进入覆盖区域的过渡区域，并且移动站可能在步骤 516 进入或退出覆盖区域，则媒体网关 210 在步骤 524 建立和移动站的第三连接线。如图 2 到 4 所示，第三连接线用内部移动线 228

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和外部移动线 306 之一表示，无论哪条线都不代表第一连接线。因此，在步骤 524 期间，媒体网关 210 和移动站 202 之间同时存在两条连接线。

媒体网关 210 可能响应一个或多个条件在步骤 524 建立第三连接线。例如，媒体网关 210 可能命令移动站 202 呼叫媒体网关，从而建立第三连接线，或媒体网关可以呼叫移动站，从而建立第三连接线。如果媒体网关 210 命令移动站 202 呼叫指向媒体网关的预定号码，则媒体网关响应接收到该呼叫建立第三连接线。例如，如果媒体网关 210 在媒体网关命令移动站 202 呼叫该预定号码后的一段特定时间周期阈值内接收到该呼叫，则建立第三连接线。同样，例如，如果媒体网关 210 从其接收该呼叫的预定号码是专用于开始第三连接线目的的，则建立第三连接线。如果媒体网关 210 呼叫移动站 202 以建立第三连接线，则该呼叫可以包括通知移动站正建立第三连接线的信息。例如，当媒体网关 210 呼叫移动站 202 时，该呼叫可以包括呼叫信号，该呼叫信号指示第三连接线和第一连接线同时存在。

对于优选实施例，媒体网关 210 在步骤 518 可以命令移动站 202 呼叫预定号码以建立到媒体网关的第三连接线，然后在步骤 520 确定移动站是否确认了呼叫该预定号码的命令。例如，移动站 202 可以通过呼叫该预定号码来确认该命令。如果移动站 202 未在步骤 520 确认该命令，媒体网关 210 通过循环步骤 520 和 522 来继续等待来自移动站 202 的确认或呼叫结束的指示。如果在步骤 522 呼叫结束，则操作在步骤 534 终止。

如果移动站 202 在步骤 520 确认了该命令，则媒体网关 210 在步骤 524 建立媒体网关和移动站之间的第三连接线，即线 3。然后，媒体网关 210 在步骤 526 将媒体网关和移动站 202 之间的通信从第一连接线切换到第三连接线。如由步骤 526 和 528 所表示的，媒体网关 210 在步骤 528 继续尝试媒体网关和移动站 202 之间的通信切换，直至切

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换成功。在步骤 528 切换成功之后，媒体网关 210 在步骤 530 通过断开第一连接线断开媒体网关和移动站 202 之间的通信。如果在到达步骤 532 时呼叫没有结束，媒体网关再次在步骤 510 监测移动站 202 相对于覆盖区域的过渡区域 302 的位置。否则，如果呼叫结束，操作在步骤 534 结束。

参考图 6，显示了移动站 202 的不同组件。移动站 202 通常包括至少一个天线 602，两个收发机电路 604、606 以及多个其他组件 608-614。移动站 202 的各个组件可以部分集成或集成为一个整体。例如，虽然图 6 所示收发机电路 604、606 是分离电路，它们可被组合成一个单个电路。

如图 6 所示，移动站 202 包括第一收发机电路 604（收发机 1）和第二收发机电路 606（收发机 2）。第一收发机电路 604 在第一覆盖区域内和第一网络通信，第二收发机电路 606 在第二覆盖区域内和第二网络通信。第二覆盖区域不同于第一覆盖区域，且优选的第二网络不同于第一网络。对于移动站 202 的优选实施例，第一网络是载波网络和非载波网络之一，第二网络是载波网络和非载波网络的另一个。非载波网络是不由载波管理的无线局域网。例如，载波网络可以是蜂窝网络，非载波网络可以是企业网。

移动站 202 还包括含有处理器 608 的主电路，以及连接到处理器的存储部分 610、显示器 612 和用户接口 614。处理器根据存储在存储部分 610 的应用程序以及存储在该存储部分的数据操作提供移动站 202 的通用操作。存储在存储部分 610 的应用程序包括（但不限于）：用于管理通过媒体网关 210 和远程站 204 的呼叫的处理器代码，用于同时经第一和第二收发机电路 604、606 和媒体网关通信的处理器代码，用于将和媒体网关的通信从第一收发机电路切换到第二收发机电路的处理器代码，以及用于断开经第一收发机电路和媒体网关的通信的处理器代码。因此，处理器提供如以下参考图 7 所述的操作，允许

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第一和第二网络之间的无缝转换。同样，在执行上述处理器代码的同时，显示器 612 和用户接口 614 提供促进移动装置 202 操作的用户交互。

主电路连接到第一和第二收发机电路 604、606，并用于管理和远程站的呼叫。对于优选实施例，处理器 608 连接到第一和第二收发机电路 604、606。主电路能同时操作第一和第二收发机电路 604、606，并将用于呼叫的通信从第一收发机电路 604 切换到第二收发机电路 606。更具体的，主电路能经第一收发机电路 604 或第二收发机电路 606 中的任一个连接第一连接线到远程站 204，经第一收发机电路和第二收发机电路中的另一个开始到远程站的第二连接线，并断开第一连接线。主电路在操作第一收发机电路 604 时，响应接收到指示移动站 202 进入过渡区域或覆盖区域的第二区域的信号，开始第二收发机电路 606 的操作。移动站 202 可以通过位于进入或退出非载波覆盖区域的特定范围内来进入该过渡区域。

由于移动站 202 包括两个收发机电路 604、606，移动站能够接收到其通信网络号码和第二网络号码的呼叫。主电路能够和媒体网关 210 同步的切换通信。对于优选实施例，主电路能切换用于呼叫的通信，如果（a）远程站 204 开始指向媒体网关 210 的到移动站 202 的通信网络号码或预定号码的呼叫，或（b）移动站开始指向媒体网关 210 的到移动站 202 的通信网络号码或预定号码的呼叫。同样，对于优选实施例，如果远程站 204 开始到移动站 202 的第二网络号码的呼叫，主电路不能切换用于该呼叫的通信。

如果移动站 202 开始到远程站 204 的第二网络号码的呼叫，主电路能或不能切换用于该呼叫的通信。如上所述，如果移动站呼叫建立到媒体网关 210 的连接的预定号码，且媒体网关 210 建立到远程站 204 的第二网络号码的呼叫，则移动站 202 的主电路能够切换。用户还可以通过经移动站 202 的用户接口输入远程站 204 的第二网络号码开始

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该呼叫。移动站 202 随后使用预定号码或远程站 204 的通信网络号码建立到媒体网关 210 的呼叫，对于用户是明显的。例如，对于优选实施例，无论何时移动站 202 位于通信网络 206 的覆盖区域之内，对通信网络连接给予优先级（相对于第二网络连接）。也可以在移动站 202 位于通信网络 206 之内或之外出现此种情形。只要移动站 202 经媒体网关 210 建立呼叫，以便建立从移动站 202 到媒体网关 210 的内部或外部通信线，移动站就能在通信和第二网络 206、214 之间切换通信。

图 6 还可以表示远程装置 204。远程站 204 可以在所有方面和移动站 202 类似。然而，本发明的正常操作不要求移动和远程站 202、204 相同。更具体的，远程站 204 无需如上所述用于移动站 202 的第二收发机电路 606 和存储在存储部分 610 的应用程序或处理器代码。实际上，现有通信装置可操作为远程装置 204。

参考和图 6 相关的图 7，提供显示移动站 202 优选操作的流程图 700。在步骤 702 开始操作之后，在步骤 708 建立移动站 202（MS）和远程站 204（RS）之间的呼叫。更具体的，在媒体网关 210 和移动站 202 的第一收发机电路 604 之间建立通信。在连接呼叫之后，移动站 202 在步骤 712 确定呼叫是否结束或在步骤 714 确定移动站是否进入覆盖区域的过渡区域 302。如果媒体网关 210 在步骤 712 确定呼叫结束，则操作在步骤 734 结束。

如果到达步骤 712 时呼叫没有结束，移动站 202 在步骤 714 进入覆盖区域的过渡区域，则在步骤 724 在媒体网关 210 和移动站的第二收发机电路 606 之间建立通信。在步骤 724 期间，第一和第二收发机电路同时和媒体网关 210 以及移动站 202 通信。

响应一个或多个条件在步骤 724 建立媒体网关 210 和第二收发机电路 606 之间的通信。例如，媒体网关 210 可以命令移动站 202 呼叫指向媒体网关的预定号码，或媒体网关可以呼叫移动站并通知移动站

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正建立连接。

移动站 202 然后在步骤 726 将媒体网关 210 和移动站之间的通信从第一收发机电路 604 切换到第二收发机电路 606。该移动站 202 的切换操作是和媒体网关 210 执行的类似切换操作（图 5 步骤 526）同步执行的。如步骤 726 和 728 所示，移动站 202 继续尝试媒体网关和移动站 202 之间的通信切换，直至在步骤 728 该切换成功。在步骤 728 切换成功之后，媒体网关 210 在步骤 730 断开媒体网关和移动站 202 的第一收发机电路 604 之间的通信。如果到达步骤 712 时呼叫没有结束，则移动站 202 再次在步骤 714 确定移动站是否进入覆盖区域的过渡区域 302。否则，如果呼叫结束，操作在步骤 734 结束。

应当理解，在本发明优选实施例中，至少给移动站 202 分配两个号码，以允许网络间的切换。然而，可为移动站 202 分配多于两个的号码。例如，可为移动站 202 分配通用号码，并存储在和媒体网关 210 相关的无缝移动寄存器中。此时，在此说明的使用情况是相同的，除了发起呼叫的站可能采用被叫站的通用号码而不是通信网络号码。媒体网关 210 如所需要的翻译通用号码，和在此说明的例子一样，以建立呼叫，从而总是如在此所述的通过媒体网关维护载荷信道。

虽然图示和说明了本发明的优选实施例，应当理解本发明不限于此。本领域技术人员可以作出多种修改、改变、变化、替换以及等效，而不背离如附随权利要求所定义的本发明的精神和范围。

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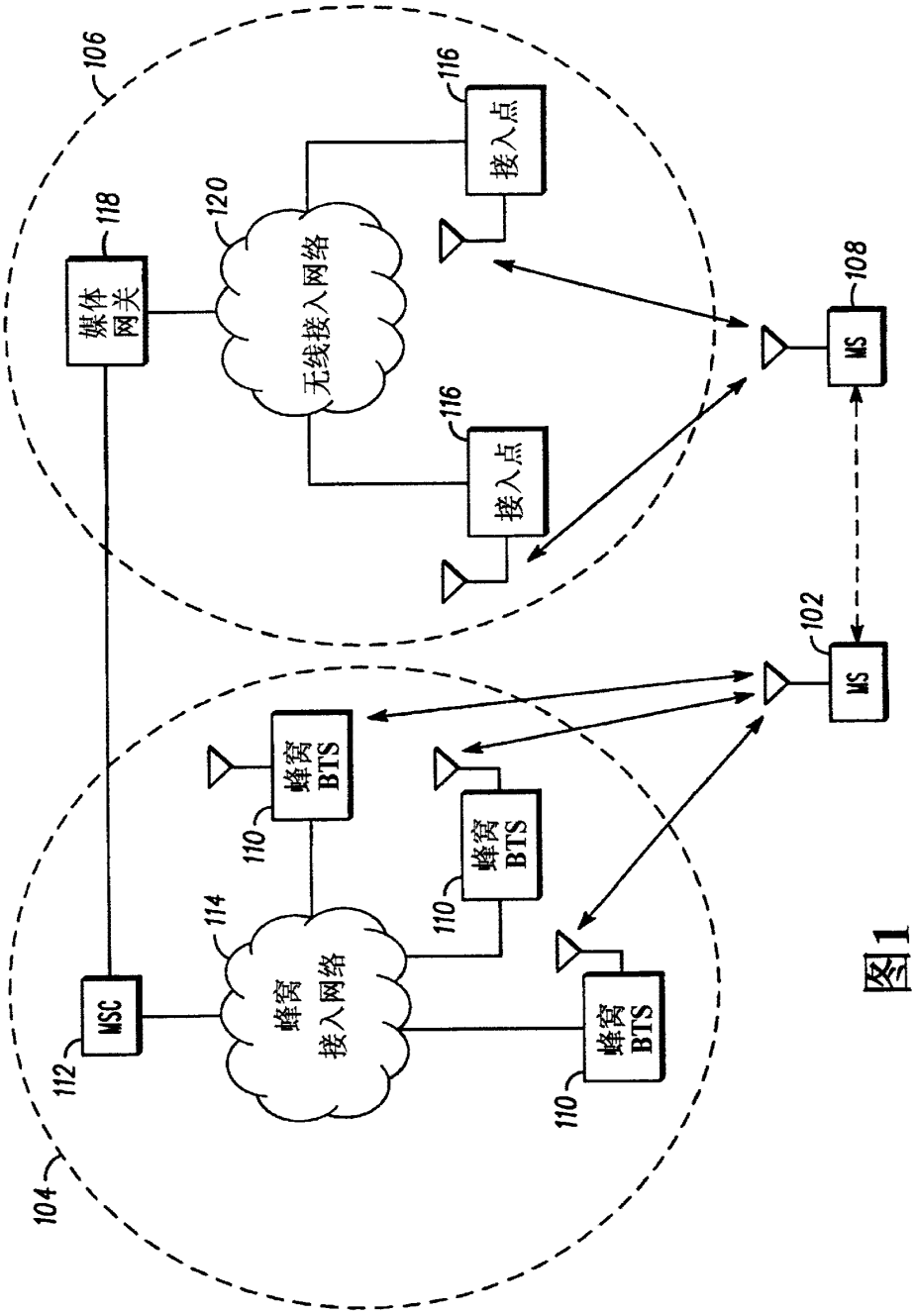


图1

IPR2025-00450 Page 00404

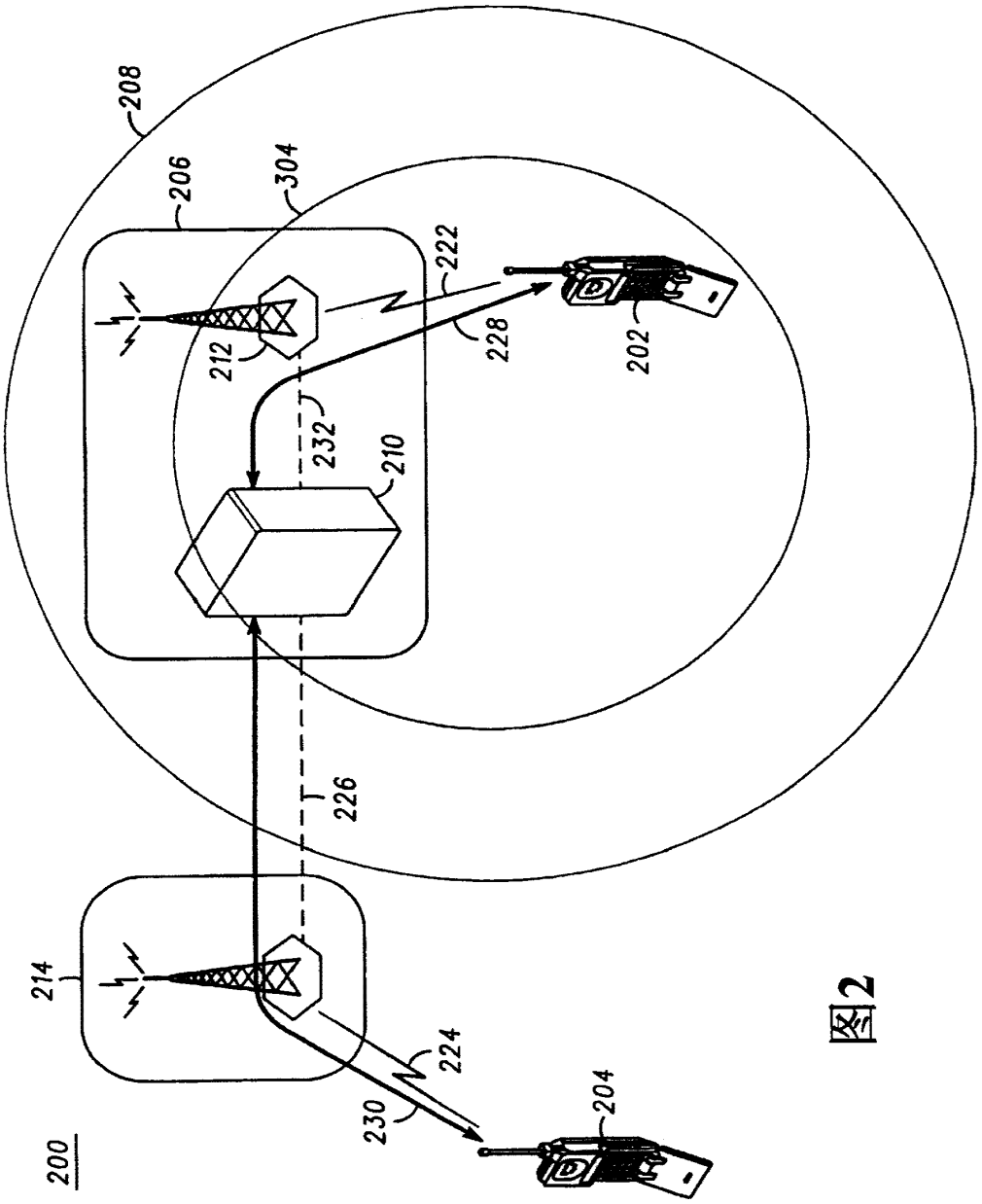


图2

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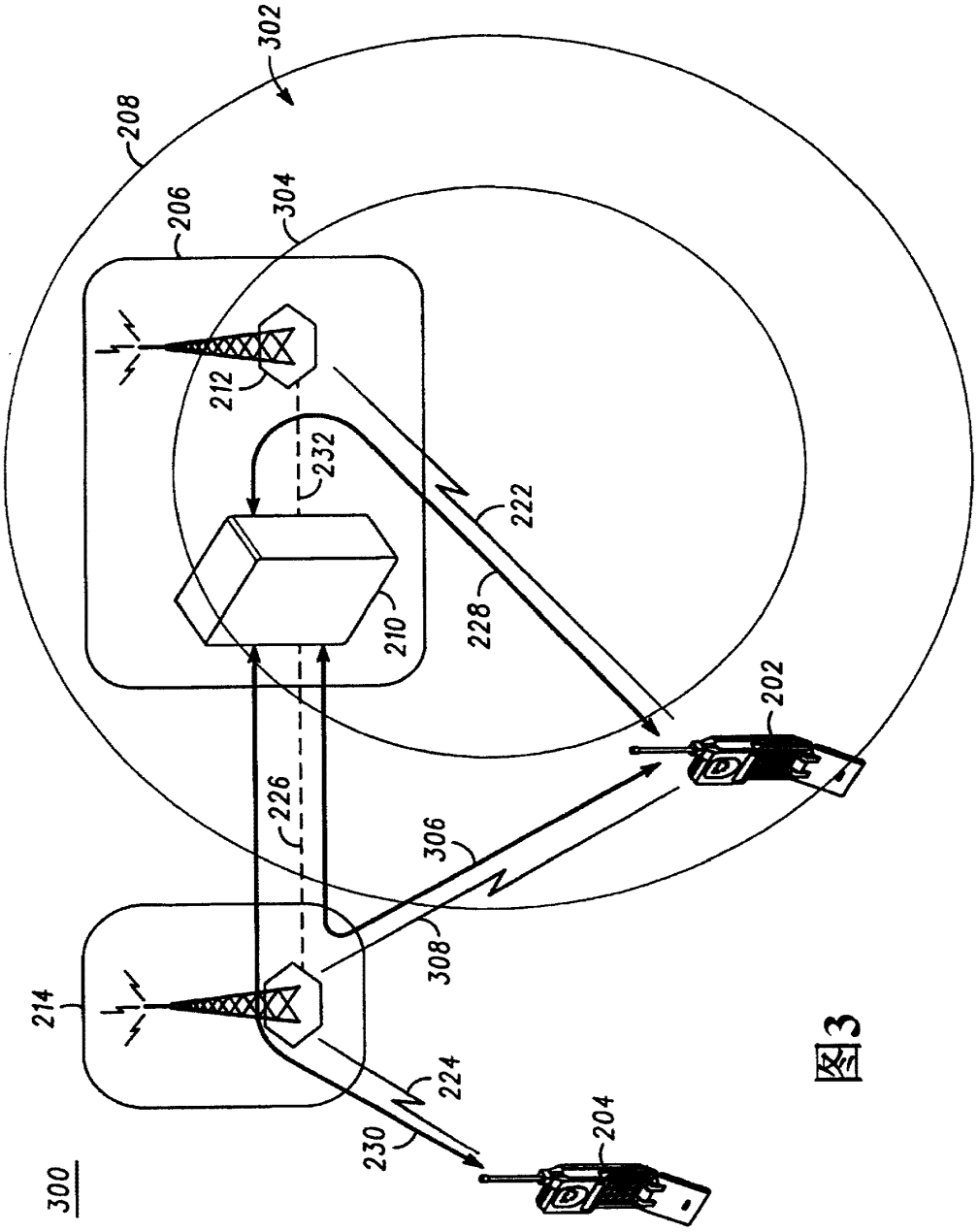


图3

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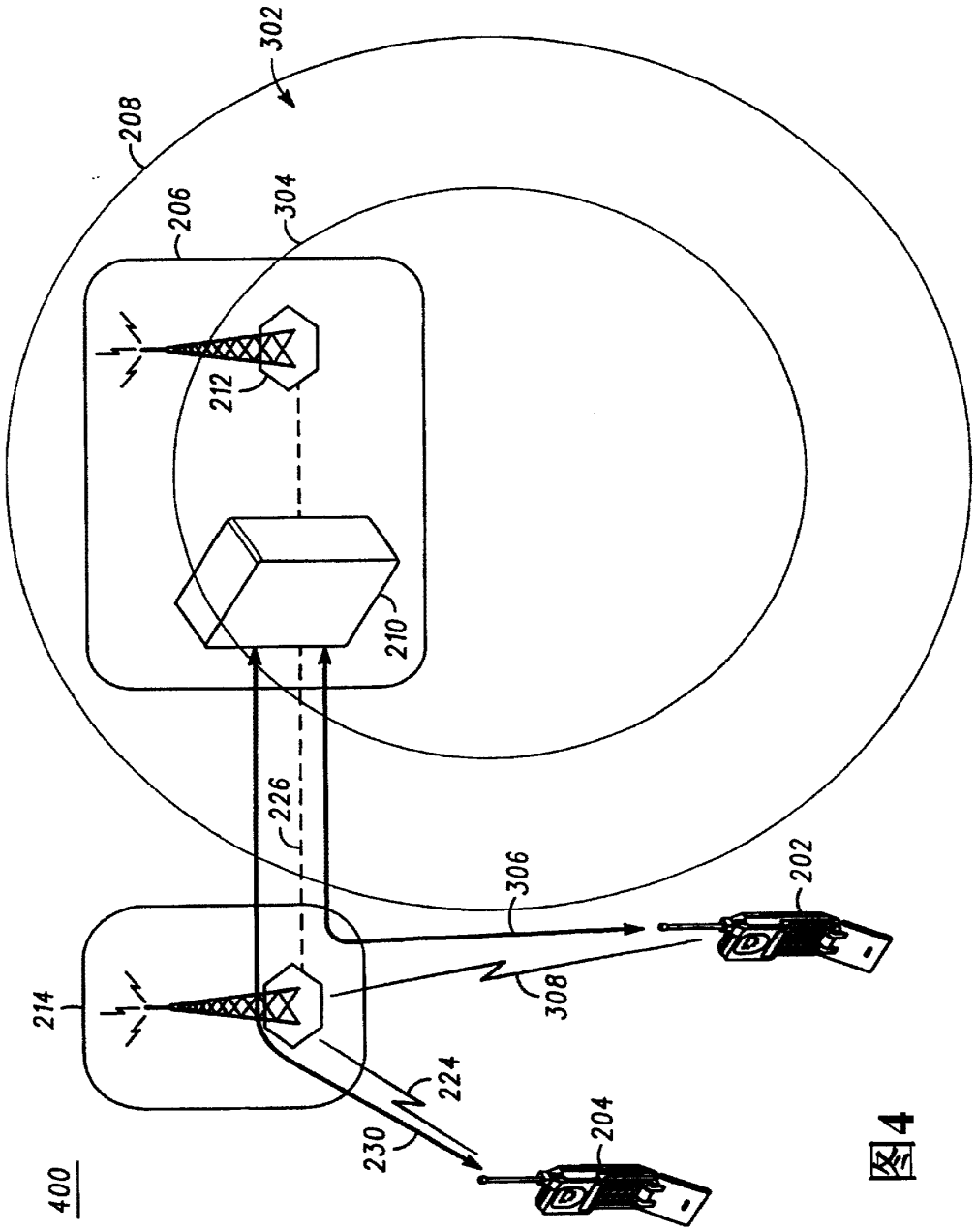


图4

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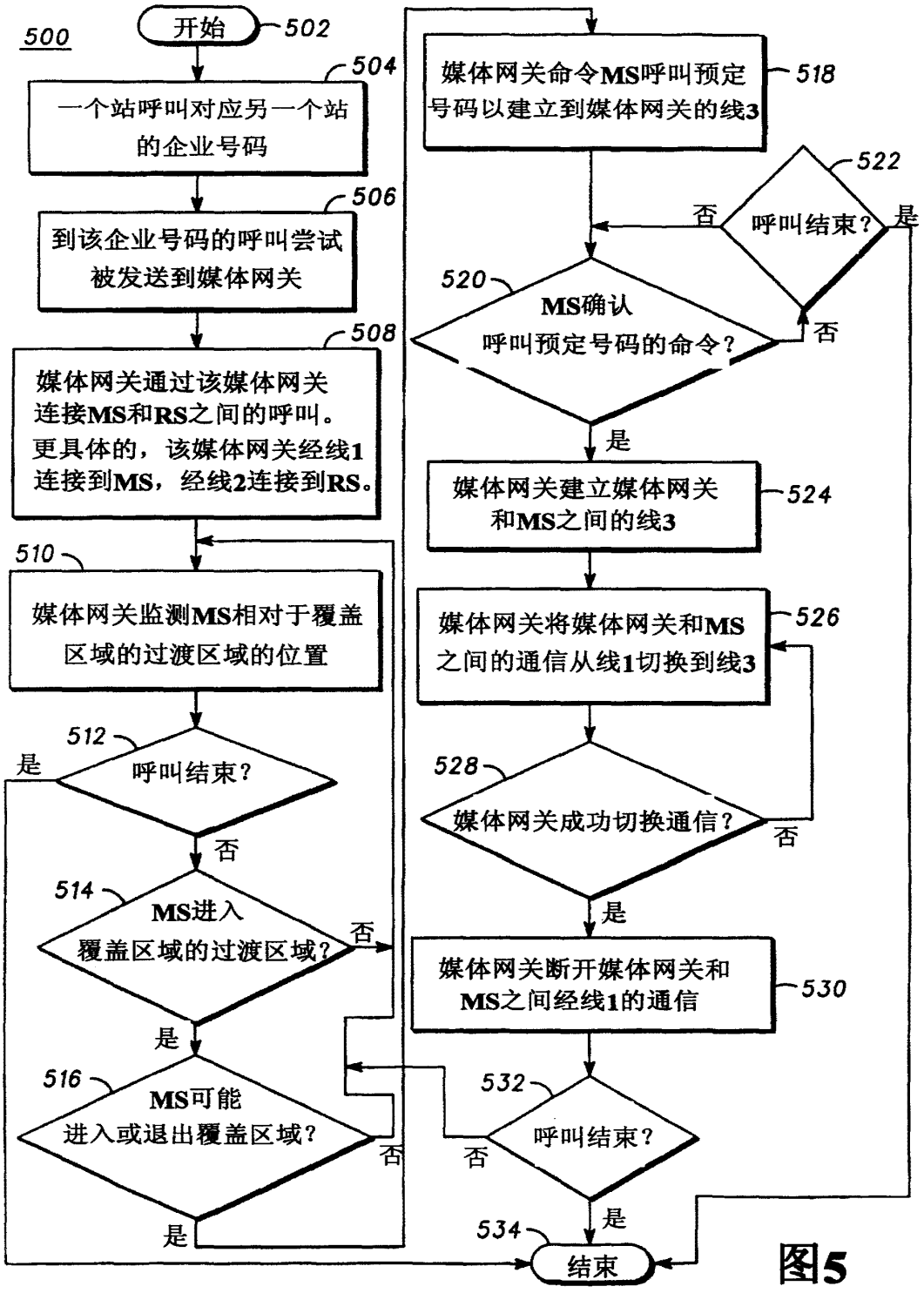


图5

IPR2025-00450 Page 00408

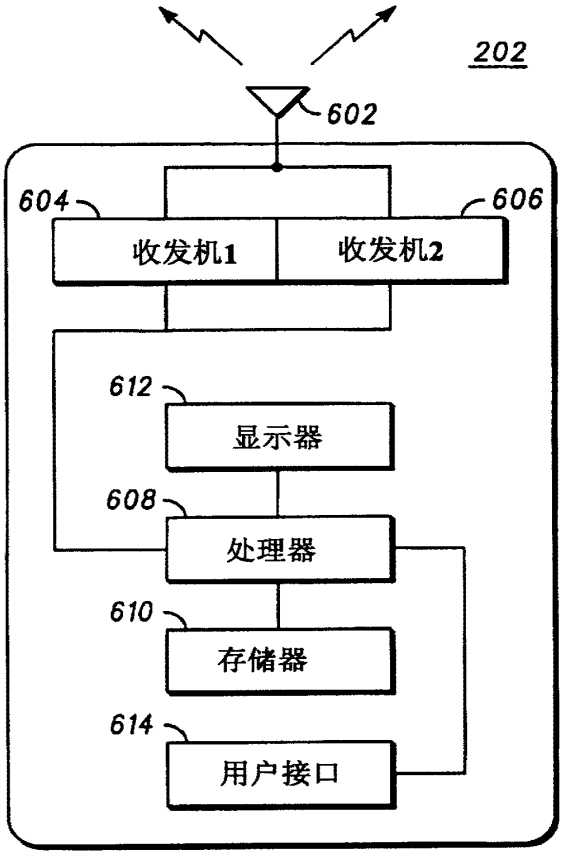
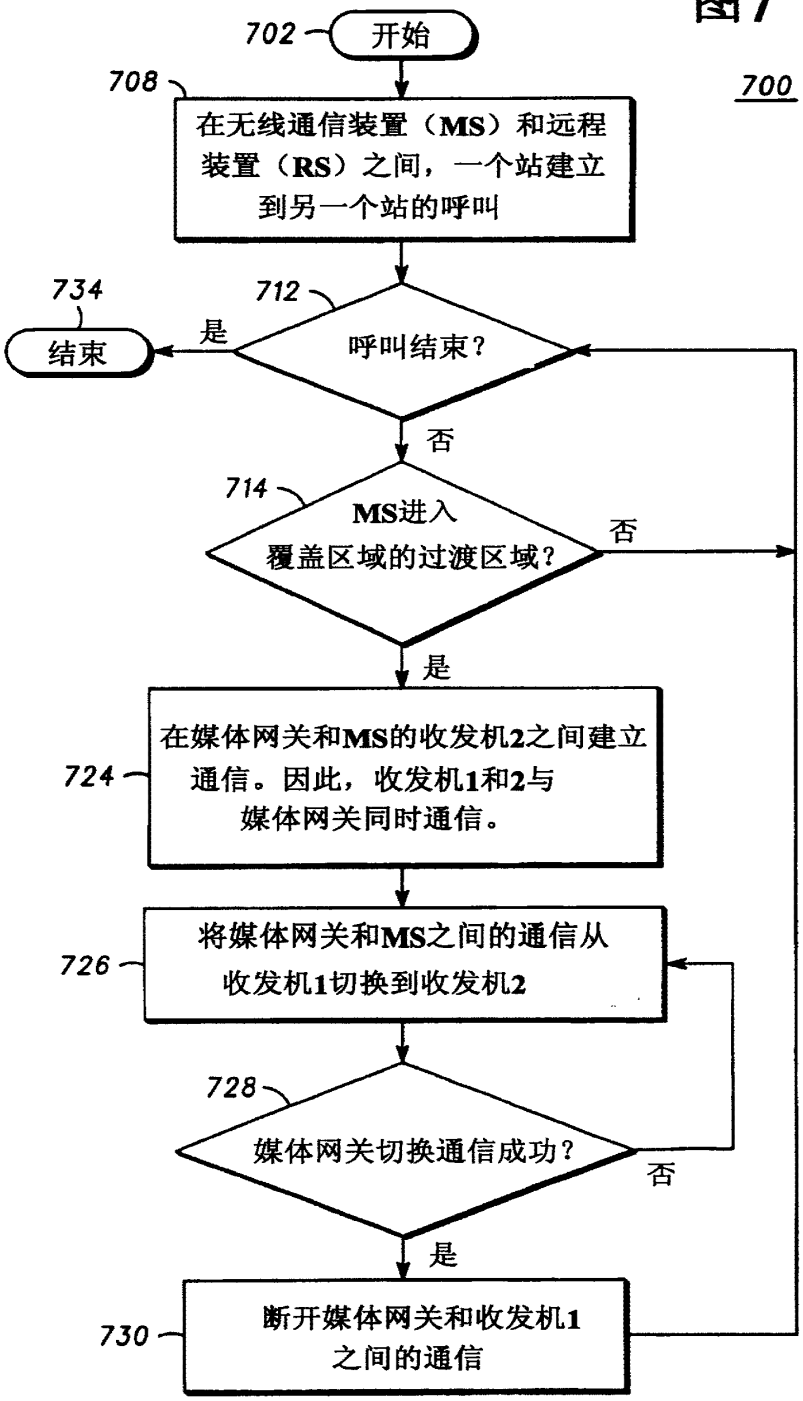


图6

IPR2025-00450 Page 00409

图7



IPR2025-00450 Page 00410

Electronic Acknowledgement Receipt

EFS ID:	32522296
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	03-MAY-2018
Filing Date:	14-MAR-2018
Time Stamp:	13:08:57
Application Type:	Utility under 35 USC 111(a)

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_5_3_2018.pdf	612290 7335b503b2b11acda3fe181961b515406a6283bf	no	4

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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

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	3	20040267880	A1	2004-12-30	Patiejunas, Kestutis	
	4	20060092901	A1	2006-05-04	Parantainen	
	5	20110044310		2011-02-24	Uhlik, Christopher	

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	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

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A certification statement is not submitted herewith.

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Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-07-13
Name/Print	Jonathan O. Owens	Registration Number	37902

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EFS ID:	33177574
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	13-JUL-2018
Filing Date:	14-MAR-2018
Time Stamp:	17:32:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_7_13_2018.pdf	612421 963062b92ad3208f00e4a3182c89142a5e5f7088	no	4

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507

CONFIRMATION NO. 7190

28960
HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

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Title:MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

Publication No.US-2018-0206164-A1
Publication Date:07/19/2018

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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	
	Attorney Docket Number	HAVA-00507

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	1	20030163697	A1	2003-08-28	Kuldip singh Pabla	
	2	20040052223	A1	2004-03-18	Jeyhan Karaoguz	
	3	20050135286	A1	2005-06-23	Jukka K. Nurminen	
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	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	
	Attorney Docket Number	HAVA-00507

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	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	
	Attorney Docket Number	HAVA-00507

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The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-09-25
Name/Print	Jonathan O. Owens	Registration Number	37902

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

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The information provided by you in this form will be subject to the following routine uses:

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2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

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5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	33820736
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	25-SEP-2018
Filing Date:	14-MAR-2018
Time Stamp:	14:38:01
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_9_25_2018.pdf	612412 88f656efc101b92e83d8ee4dd071ecdb09fd8666	no	4

Warnings:

Information:	
Total Files Size (in bytes):	612412

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

28960 7590 11/06/2018

HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

EXAMINER	
NGUYEN, TU X	

ART UNIT	PAPER NUMBER
2649	

MAIL DATE	DELIVERY MODE
11/06/2018	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 15/921,275	Applicant(s) Ganesan et al.	
	Examiner TU X NGUYEN	Art Unit 2649	AIA Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 14 March 2018.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1-47 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-47 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on See Continuation Sheet is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☑ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

Continuation of Application Papers 11): 14 March 2018

DETAILED ACTION

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of pre-AIA 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same, and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claim 39 are rejected under 35 U.S.C. 112(a) or 35 U.S.C. 112 (pre-AIA), first paragraph, as failing to comply with the written description requirement. The claim contains subject matter (switching between the plurality of technology stacks) which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor or a joint inventor, or for pre-AIA the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-3, 5-8, 10-18, 20-24, 26-32, 34-38 and 40 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400, IDS dated 3/30/18) in view of Krantz et al. (US Pub. 2004/0153676).

Regarding claims 1 and 36, Jagadeesan et al. discloses a device comprising:

a switching system if a context changes for known networks (par.017 "a subscription or an agreement may be provided by cellular network 14", par.018 "wireless communications in a designated area") or a new network (par.021 "WLAN...coffee shops airports, restaurants hotels"), is detected with a more favorable context (par.004, 032-033, LQI, RSSI), a previously established communication automatically switches accordingly (par.008 "automatically handoff the call from the cellular network to the WLAN and vice versa").

Jagadeesan et al. discloses mobile device includes dual-mode technology to support the transition from one network to another (par.025 "dual mode functionality such that it may support multiple different communication modes, such as 802.11 and cellular protocols); however, Jagdeesan et al. fails to teach switch operation between a first communication module and a second communication module.

Krantz et al. discloses switching operation between a first communication module and a second communication module (par.053 "the roaming component....802.11 network interface module 201....modules 814, 818 822"). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of Jagadeesan et al. with the above teaching of Krantz in order to provide separate communication modules having different capability to communicate accordingly with different network protocols.

Regarding claim 2, the modified Jagadeesan et al. discloses upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to an active mode (Krant, par.0048 "The power management module

201 will set the network interface module 201 to the off state….if an idle timer has expired (line 622). The power management module 201 will set the network interface module 201 to the on state 600 from the off state 620 if the device 100 has a packet to send and the network interface module 201 was put in the off state line 624").

Regarding claim 3, the modified Jagadeesan et al. discloses when the context comprises signal strength characteristics, if a signal monitor detects that a Wi-Fi signal level is equal to or greater than a predefined threshold value, a previously established communication continues without switching (Jagadeesan, elements 108-114).

Regarding claim 5, the modified Jagadeesan et al. discloses the context comprises signal strength characteristics (Jagadeesan, par.005).

Regarding claim 6, the modified Jagadeesan et al. discloses the context comprises at least one of radio signal strength, available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information, knowledge, quality of service information (Jagadeesan, par.033 LQI, SNR, BER EVM, demodulation quality indicator) service level agreement information, and history information.

Regarding claims 7-8, the modified Jagadeesan et al. fails to disclose automatic switching is between bearers on a same network (par.018 "MSC 20 may monitor the movement and the transfer of a wireless communication from one cell to another cell").

Regarding claims 10 and 20-21, the modified Jagadeesan et al. discloses the previously established communication is secure (par.014 "WLAN 16 may comprise a private network") or unsecure (par.021 "public places as coffee shops").

Regarding claim 11, the modified Jagadeesan et al. discloses the previously established communication is proprietary or standard (par.021 "IEEE 802.11 standard").

Regarding claim 12, the modified Jagadeesan et al. discloses monitoring, detecting, and/or switching are based on the context are implemented using a distributed system (Jagadeesan, par.023 "IP data network 17 may be distributed across multiple cities and geographic regions").

Regarding claims 13, 24, 26 and 35, the modified Jagadeesan et al. discloses everything as claim 1 above. More specifically the modified Jagadeesan discloses a second context (Jagadeesan, fig.3 element 106 "quality of second link"); a server (Jagadeesan, par.023 "IP data network 17 enables communication between endpoints coupled to cellular network 14, WLAN and IP data network 17").

Regarding claims 14 and 19, the modified Jagadeesan et al. discloses the communication comprises a transmission of content (Jagadeesan, par.016 video is implied to content).

Regarding claim 15, the modified Jagadeesan et al. discloses the communication comprises a data exchange (Jagadeesan, par.016 "data exchanges").

Regarding claim 16, the modified Jagadeesan et al. discloses the communication comprises at least one of a telephone call, a voice call/communication (Jagadeesan, par.024), or duplex streaming/exchange.

Regarding claim 17, the modified Jagadeesan et al. discloses the communication comprises a telephone call transformed into a second communication (Jagadeesan, par.004 "handing off a call between networks").

Regarding claim 18, the modified Jagadeesan et al. discloses the second communication comprises at least one of a voice call/communication (Jagadeesan, par.004-005) or duplex streaming/exchange.

Regarding claim 22, the modified Jagadeesan et al. discloses data streaming (Jagadeesan, par.024 video is implied to data streaming)

Regarding claim 23, the modified Jagadeesan et al. discloses the communication comprises video exchange, streaming or video calling (Jagadeesan, par.024 “video conference”).

Regarding claim 27, the modified Jagadeesan et al. discloses method is stored, in part, within a mobile communication device (Jagadeesan, par.029).

Regarding claim 28, the modified Jagadeesan et al. discloses the method is implemented, in part, on a network-based device (par.020 “a base station controller may include management of radio channels in assisting in handover scenarios”).

Regarding claims 29-30, the modified Jagadeesan et al. discloses the method is implemented, in part, on a switch and/or router (Jagadeesan, par.023).

Regarding claim 31, the modified Jagadeesan et al. discloses the method is implemented, in part, on an access point (Jagadeesan, fig.1 element 24, par.022 “access point 24…WLAN 16 may also include an access router”).

Regarding claim 32, the modified Jagadeesan et al. discloses the method is implemented, in part, on a base station (Jagadeesan, par.018 “base station systems 22”).

Regarding claim 34, the modified Jagadeesan et al. discloses the method is implemented in software (Jagadeesan, par.030), firmware and/or hardware.

Regarding claim 37, the modified Jagadeesan et al. discloses the network is operated by a different network provider (Jagadeesan, par.017 GSM, CDMA, TDMA).

Regarding claim 38, the modified Jagadeesan et al. discloses the network includes a plurality of access points, and the established communication is switched between the plurality of access points (par.021).

Regarding claim 40, the modified Jagadeesan et al. discloses the device comprises a terminal, a mobile device (Jagadeesan, par.004 “mobile station”), a sensor, an access point, and/or a controller device.

Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and further in view of Kavanagh et al. (US Pub. 2005/0025164) and Maltsev et al. (US Pub. 2014/0204902).

Regarding claim 4, the modified Jagadeesan et al. discloses a wireless network to communicate with the second communication module is selected from the group consisting of 2G, 3G (Jagadeesan, par.017); however, the modified Jagadeesan et al. fails to teach 4G, 5G, LTE,and WiMAX.

Kavanagh et al. disclose WiMAX network (par.051). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Kavanagh et al. in order to provide handoff to other standard network such as WIMAX which provide IP connection.

Maltsev et al. discloses 4G, 5G and LTE (par.024). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Maltsev et al. in order to provide handoff to latest network technologies. Maltsev et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claim 9 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and further in view of Azada et al. (US Pub. 2006/0105766).

Regarding claim 9, the modified Jagadeesan et al. discloses the previously established communication comprises: a cellular communication, a VoIP communication / session (par.034), a voice communication / session, a video communication / session (par.016), a data communication / session (par.016 “voice or data exchanges”), SIP session (Jagadeesan, par.023 IP phone is inherently included SIP session) or a WiFi communication (par.005 “IEEE 802.11 protocol”). However, the modified Jagadeesan fails to teach multimedia communication, SIP or IMS based communication.

Azada et al. discloses multimedea communication, SIP or IMS based communication (par.016 “SIP session”, par.043 “IMS network”, par.021 “multimedia services”). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Azada et al. in order to provide an enhanced communication

both existing wireless service providers and other service providers just entering the wireless arena as suggested by Azada (par.007). Azada et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claims 33 and 39 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and Jaakola et al. (US Pub. 2006/0009219).

Regarding claim 33, the modified Jadadeesan et al. fails to teach the method is implemented on a transportation device selected from the group consisting of an automobile, a ship, a boat, and an airplane.

Jaakola et al. discloses a transportation device selected from the group consisting of an automobile, a ship, a boat, and an airplane (par.017). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Jaakola et al. in order to provide a mobile telephone can be carried by an individual who is moving as suggested by Jaakola et al.. Jaakola et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claim 39 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and further in view of Solomon et al. (US Pub. 2006/0010272).

Regarding claim 39, the modified Jagadeesan et al. fails to teach the network includes a plurality of technology stacks, and the established communication is switched between the plurality of technology stacks.

Bontu et al. discloses the network includes a plurality of technology stacks, and the established communication is switched between the plurality of technology stacks (par.059). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Solomon e al. in order to seamlessly handoff between different networks. Solomon et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claims 41-42 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Fors et al. (US Pub. 2004/0203788).

Regarding claim 41, Jagadeesan et al. discloses a method comprising:

establishing a first communication link between a mobile communication device and an end destination device, wherein the first communication link comprises a first wireless communication link between the mobile communication device and a first wireless network (par.004 “actively connected with WLAN”);

monitoring a signal strength of the first wireless communication link (par.005 “monitoring the quality of the first link”;

when the signal strength drops below a threshold (par.004 “the first link is less than a handoff trigger threshold”), notifying an interface server (par.023 IP data network

17 enables communication between endpoints coupled to cellular network 14, WLAN and IP data network") and establishing a second communication link between the interface server and the end destination device without disrupting the first communication link (par.036 This enables mobile station 12 to be connected to both WLAN network 16 and cellular network 14 at the same time during handoff and ensures that a connection is made");

re-directing the second communication link from the interface server to another mobile communication device, thereby establishing a second wireless communication link between the mobile communication device and a second wireless network (par.036 "handoff" is implied to "re-directing").

Jagadeesan fails to teach notifying an interface server to establish a second communication and the server notifying the mobile communication device to terminate transmission over the first communication link.

Fors et al. discloses notifying an interface server to establish a second communication (par.007 the BS generates a Handoff Required message....the source MSC then identifies the target BS") and the server notifying the mobile communication device to terminate transmission over the first communication link (par.009 "the IS95_Handoff Direction Message instructs the MS to switchover to the target cell/BS"). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Fors et al. in order to provide handoff procedures between the mobile station and communication networks.

Regarding claim 42, the modified Jagadeesan et al. discloses re-directing is known by preferences (par.005 "the existing list of neighboring cells to include cells of the other technology") and attached or attachable to the network.

Claims 43-47 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Fors et al. (US Pub. 2004/0203788) and further in view of Krantz et al. (US Pub. 2004/0153676).

Regarding claim 43, the modified Jagadeesan et al. discloses everything as claim 41 above; however, the modified Jagadeesan fails to teach establishing the second wireless communication link between the mobile communication device.

Krantz et al. disclose establishing the second wireless communication link between the mobile communication device (par.030). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Karntz et al. in order to provide the mobile device may also be part of a peer-to-peer network whichever network is available in the area.

Regarding claim 44, the modified Jagadeesan et al. discloses a function of the interface is distributed (Jagadeesan, par.,023 "IP data network 17 may be distributed across multiple cities and geographic regions").

Regarding claim 45, the modified Jagadeesan et al. discloses the context comprises at least one of radio signal strength (Jagadeesan, par.005 "a received signal strength"), available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information,

knowledge,quality of service information, service level agreement information, and history information.

Regarding claim 46, the modified Jagadeesan et al. discloses the method is distributed across a plurality of network components (par.023 switches, routers,hubs, call managers, endpoints, gateways and other suitable network components").

Regarding claim 47, the modified Jagadeesan et al. discloses the method is utilized in a peer-to-peer communication (Krantz, par.030).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571)272-7883. The examiner can normally be reached on 8AM-5PM Eastern Time.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, Applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, SPE can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TU X NGUYEN/
Primary Examiner, Art Unit 2649

Notice of References Cited	Application/Control No. 15/921,275	Applicant(s)/Patent Under Reexamination	
	Examiner TU X NGUYEN	Art Unit 2649	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-20060105766-A1	05-2006	Azada; Maria Rg	H04W48/18	455/432.1
*	B	US-20040153676-A1	08-2004	Krantz, Anton W.	G06F1/3203	713/300
*	C	US-20140204902-A1	07-2014	Maltsev; Alexander	H04W36/0083	370/331
*	D	US-20040203788-A1	10-2004	Fors, Chad M.	H04W36/0066	455/439
*	E	US-20050025164-A1	02-2005	Kavanagh, Alan	H04W36/0033	370/401
*	F	US-20060010272-A1	01-2006	Solomon; Doron	G06F15/7867	710/105
*	G	US-20060009219-A1	01-2006	Jaakkola; Mikko	H04B1/406	455/435.2
	H					
	I					
	J					
	K					
	L					
	M					

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	**Art Unit**
	TU X NGUYEN	2649

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/23/2018								
	1	✓								
	2	✓								
	3	✓								
	4	✓								
	5	✓								
	6	✓								
	7	✓								
	8	✓								
	9	✓								
	10	✓								
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	36	✓								
	37	✓								
	38	✓								
	39	✓								
	40	✓								
	41	✓								
	42	✓								

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	Examiner	Art Unit
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CLAIM		DATE								
Final	Original	10/23/2018								
	43	✓								
	44	✓								
	45	✓								
	46	✓								
	47	✓								

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	Art Unit
	TU X NGUYEN	2649

CPC - Searched*		
Symbol	Date	Examiner
H04W36/0016	10/23/2018	TN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
455	436,437,438,439,442,444	10/23/2018	tn

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Search EAST, history	10/23/2018	TN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

Bibliographic Data

Application No: 15/921,275

Foreign Priority claimed: ○ Yes ◉ No

35 USC 119 (a-d) conditions met: ☐ Yes ☐ No ☐ Met After Allowance

Verified and Acknowledged: /TU X NGUYEN/ Examiner's Signature | Initials

Title: MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
03/14/2018	455	2649	HAVA-00507
RULE			

APPLICANTS

Vasu Networks Corporation, San Jose, CA,

INVENTORS

Vasudevan Ganesan San Jose, CA, UNITED STATES

Stephane H. Maes Fremont, CA, UNITED STATES

CONTINUING DATA

This application is a CIP of 15480293 04/05/2017

15480293 is a CON of 14806482 07/22/2015 PAT 9648538

14806482 is a CON of 13899303 05/21/2013 PAT 9125128

13899303 is a CON of 13168585 06/24/2011 PAT 8467789

13168585 is a CON of 11031498 01/06/2005 PAT 7991399

11031498 has PRO of 60534466 01/06/2004

FOREIGN APPLICATIONS

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HAVERSTOCK & OWENS LLP

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SUNNYVALE, CA 94086

UNITED STATES

FILING FEE RECEIVED

$3,285

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
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Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2642
Examiner Name	
Attorney Docket Number	HAVA-00507

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/T.X.N/	1	20030163697	A1	2003-08-28	Kuldip singh Pabla	
/T.X.N/	2	20040052223	A1	2004-03-18	Jeyhan Karaoguz	
/T.X.N/	3	20050135286	A1	2005-06-23	Jukka K. Nurminen	
/T.X.N/	4	20060003796	A1	2006-01-05	Richard P. Vireday	
/T.X.N/	5	20060141984	A1	2006-06-29	Claudio Taglienti	

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SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-09-25
Name/Print	Jonathan O. Owens	Registration Number	37902

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7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
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Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2642
Examiner Name	not yet assigned
Attorney Docket Number	HAVA-00507

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	/T.X.N/ 1	20030009580	A1	2003-01-09	Chen, Xiaobao X.	
	/T.X.N/ 2	20040053599	A1	2004-03-18	Karaoguz, Jeyhan	
	/T.X.N/ 3	20040267880	A1	2004-12-30	Patiejunas, Kestutis	
	/T.X.N/ 4	20060092901	A1	2006-05-04	Parantainen	
	/T.X.N/ 5	20110044310		2011-02-24	Uhlik, Christopher	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
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	First Named Inventor	Vasudevan Ganesan
	Art Unit	2642
	Examiner Name	not yet assigned
	Attorney Docket Number	HAVA-00507

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See attached certification statement.

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A certification statement is not submitted herewith.

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Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-07-13
Name/Print	Jonathan O. Owens	Registration Number	37902

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/T.X.N/	1	1723719	CN	A	2006-01-18	Motorola Inc		

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	Attorney Docket Number	HAVA-00507

	/T.X.N/ 1	Copy of Office Action from Chinese Patent Application No.: 201510039302.4, dated February 8, 2018.	X

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A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-05-03
Name/Print	Jonathan O. Owens	Registration Number	37902

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Doc description: Information Disclosure Statement (IDS) Filed

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	
Examiner Name	Not yet assigned
Attorney Docket Number	HAVA-00507

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/T.X.N/	1	6009328		1999-12-28	Muszynski	
/T.X.N/	2	6175737	B1	2001-01-16	Kao, Chiiming	
/T.X.N/	3	6195543		2001-02-27	Granberg	
/T.X.N/	4	6473413	B1	2002-10-29	Chiou et al.	
/T.X.N/	5	6515983	B1	2003-02-04	Utas	
/T.X.N/	6	6553022	B2	2003-04-22	Hartmaier	
/T.X.N/	7	6584087	B1	2003-06-24	Czaja et al.	
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/T.X.N/	9	6795700	B2	2004-09-21	Karaoguz et al.	
	10	6862444	B2	2005-03-01	Karaoguz et al.	
	11	6996107	B2	2006-02-07	Janoska	
	12	7127232	B2	2006-10-24	O'Neil et al.	
	13	7142847	B2	2006-11-28	Umeda et al.	
	14	7254119	B2	2007-08-07	Jiang et al.	
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	16	7398088	B2	2008-07-08	Belkin et al.	
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/T.X.N/	20	8514867	B2	2013-08-20	Ganesan	
/T.X.N/	21	8520605	B2	2013-08-27	Ganesan	
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/T.X.N/	1	20010049790	A1	2001-12-06	Faccin et al.	
	2	20020078174	A1	2002-06-20	Sim et al.	
	3	20020085516	A1	2002-07-04	Bridgelall	
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/T.X.N/	7	20020183038	A1	2002-12-05	Comstock et al.	
	8	20030012350	A1	2003-01-16	Wong et al.	
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	41	20060040711	A1	2006-02-23	Whistler	
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/T.X.N/	51	20070249390	A1	2007-10-25	Purkayastha et al.	
	52	20090070489	A1	2009-03-12	Lu et al.	
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/T.X.N/	62	20040205158	A1	2004-10-14	Raymond T. Hsu	
	63	20060098643	A1	2006-05-11	Pfeffer	
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	66	20030133421	A1	2003-07-17	Rangamani Sundar	
	67	20040076144	A1	2004-04-22	Takashi Ishidoshiro	
	68	20040083360	A1	2004-04-29	Rod Walsh	
	69	20040095916	A1	2004-05-20	Makoto Maki	
	70	20040170173	A1	2004-09-02	Pan, Ping	
	71	20050239498	A1	2005-10-27	Dorenbosch, Jheroen P.	
	72	20070026862	A1	2007-02-01	Jon Alson Hicks III	

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/T.X.N/	1	200310113	DE	UI	2004-01-15	InterDigital Technology Corporation		
	2	0936777	EP	A1	1999-08-18	Lucent Technologies Inc.		
	3	1471665	EP	A1	2004-10-27	Legend (Beijing)Limited		
	4	2287858	GB	A	1995-09-27	Motorola Limited		
	5	200226994	JP	A	2002-01-25	Nec Corporation		
	6	2004320473	JP	A	2004-11-11	ISHIKURA KATSUTOSHI		
	7	03056719	WO	A1	2003-07-10	Legend (Beijing)Limited		
	8	2004013998	WO	A2	2004-02-12	Motorola, Inc.		
	9	2004057903	WO	A1	2004-07-08	Fujitsu Limited		

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/T.X.N/	10	2003061177	WO	A2	2003-07-27	Winphoria Networks Inc.		
/T.X.N/	11	2003061177	WO	A3	2003-07-24	Winphoria Networks Inc.		

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/T.X.N/	1	3GPP Organization Project,"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects Service Aspects; Handover requirements between UTRAN and GERAN or other radio systems (Release 8)",2006-03, pages 1-20	
	2	3GPP Organization Project,"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects Service Aspects;Service Principles (Release 8)",2006-03, pages 1-45	
	3	3GPP Organization Project,"3rd Generation Partnership Project; Technical Specification Group Services and System Aspects Service Aspects; Service Requirements for the All-IP Network(AIPN);V8.0.0, Stage 1, (Release 8),page 1-24	
	4	Unlicensed Mobile Access (UMA); Protocols (Stage 3)", R1.0.4, 2005-05-02, pages 1-162	

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	Examiner Name	Not yet assigned
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☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:33
L2	1	("9125128").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:34
L3	1	("8467789").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
L4	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
L5	1	("20060105766").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 16:43
L6	234	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with ((session near3 invitation$1) ims)	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09
L7	1	L6 and (vasu ganesan vasudevan maes stephane).inv.	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09
S1	1	("20050059400").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:49
S2	4	(("7991399") or ("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:53
S3	3	(("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S4	2	(("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S5	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:55

S6	1453	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin switch$3 automatic$4 module$1 transceiver$1 profile memor$3 storag$3 chang$4 (hand near2 (over off)) connect$4 select$3 histo$3) with (greater higher equal$2 ping second third strong$4)	US-PGPUB; USPAT	OR	OFF	2018/01/05 20:10
S7	4707	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long near2 range)) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:14
S8	4747	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long near2 range)) with (wimax wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:14
S9	1511	S8 and ((second multipl$4 plura$4 third) near3 (threshold$1 level$1 margin$1 strength))	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:32
S10	5	(("20020152305") or ("20030133421") or ("20040076144") or ("20040083360") or ("20040095916")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:46
S11	9	(("6009328") or ("6165737") or ("6195543") or ("0647413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:54
S12	11	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119") or ("7382763") or ("7398088") or ("7483984") or ("7512796") or ("8041360")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:57
S13	8	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:04
S14	10	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766") or ("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("2003021791")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:25
S15	10	(("20030224792") or ("20030232615") or ("2004005878") or ("20040030791") or ("20040085959") or ("20040087307") or ("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:29

S16	11	(("20040174880") or ("20040203666") or ("20040203788") or ("20040203802") or ("20040204097") or ("20040218575") or ("20040229618") or ("20050044138") or ("20050059400") or ("20050090259") or ("20050147049")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 07:22
S17	11	(("20050149740") or ("20060040711") or ("20060050663") or ("20060050687") or ("20060080423") or ("20060146767") or ("20060234678") or ("20060291455") or ("20070076665") or ("20070112948") or ("20070124490")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:35
S18	11	(("20070249390") or ("20090070489") or ("20100074228") or ("20110010282") or ("20060050721") or ("20030053632") or ("20040141484") or ("20040176128") or ("20040192294") or ("20040246990") or ("20040181811")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:42
S19	1	("20030058876").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:47
S20	30135	(threshold$3 with (second third fourth)) and (handoff handover (hand near2 (off over)) roam$3 switch$4) and ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") and (wwan cellular wan cdma gsm umts tdma licen$4)	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:10
S21	2400	(threshold$3 with (second third fourth)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:14
S22	1965	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:30
S23	1	"20040030791"	US-PGPUB; USPAT	OR	OFF	2018/03/29 13:09
S24	4	(("9648538") or ("9125128") or ("8467789") or ("7991399")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:39
S25	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:58
S26	0	("sctpadjstack$1").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 09:42
S27	50	sctp adj stack$1	US-PGPUB; USPAT	OR	OFF	2018/03/30 09:42
S28	0	("2004017173").PN.	US-PGPUB; USPAT;	OR	OFF	2018/03/30 12:21

			USOCR			
S29	1	("20040170173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 12:21
S30	2120	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S31	13	S30 and (ganesan vasudevan).inv.	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S32	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/06/13 06:04
S33	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/06/13 06:38
S34	22501	(sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3) with (wlan wifi "wi-fi" "802.11" (short near2 range)) with (wan wwan cell$5 macro (long near2 range))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:02
S35	12680	S34 and ((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:06
S36	2250	S35 AND ((H04W88/06 OR H04W36/14 OR H04W76/15 OR H04W8/18 OR H04W48/18 OR H04W76/25 OR H04W48/20 OR H04W52/02 OR H04W52/0245 OR H04W92/20).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:11
S37	380	S36 and timer$1 and threshold$1	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:12
S38	238	S36 and (timer$1 near3 (incre$5 activat$4 initiat$3 start$3 trigger$4))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:18
S39	5	(("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/07 09:44
S40	270610	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (threshold strength power strong$3 level$1 amplitude$1)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:49
S41	9354	S40 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53

S42	0	S41 and @ad<"01012004"	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53
S43	4434	S41 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:54
S44	130788	S40 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:21
S45	5400	S44 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:23
S46	2603	S45 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:23
S47	67699	S44 and ((tim$4 duration$1 period$5 interval$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:40
S48	3459	S47 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41
S49	1572	S48 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41
S50	241101	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S51	253563	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (standby idl$3 sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S52	24302	S51 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S53	1195	S52 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S54	458	S53 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:57
S55	447883	((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:22

		near2 range) "802.11" bluetooth "wi-fi")) and ((sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3) with (processor$1 interfac$3 transceiver$1 wifi "802.11" bluetooth module$1 "tx/rx"))				
S56	141085	S55 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:24
S57	25168	S56 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:26
S58	3184	S57 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:27
S59	37162	(cellular wwan wan gsm umts cdma tdma gprs wifi "wi-fi" "802.11" wlan (local near2 wireless)) with (module$1 transceiver session control$4 process$4 circuit$3 section) with (off turnoff sleep wake$4 standby passiv$2 activat$3 deactivat$5)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:33
S60	1863	S59 and (handover handoff (hand near2 (over off))) and ((least conserv$5 sav$5 consum$5) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:36
S61	5388	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:40
S62	5736	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5 extend$3 life) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:41
S63	5731	S62 and (power level$1 strength amplitude margin threshold$1)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:43
S64	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S65	0	("200500594000").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S66	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/11 09:18
S67	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 07:46
S68	1	("20050147049").PN.	US-PGPUB; USPAT;	OR	OFF	2018/10/19 07:48

			USOCR			
S69	865	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 09:59
S70	5	(("20030163697") or ("20040052223") or ("20050135286") or ("20060003796") or ("20060141984")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:04
S71	5	(("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:06
S72	8	(("6009328") or ("6175737") or ("6195543") or ("6473413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:10
S73	6	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:15
S74	5	(("7382763") or ("7398088") or ("7483984") or ("7512796") or ("8041360")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:17
S75	9	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020085516") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:20
S76	6	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:30
S77	5	(("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("20030217091")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:31
S78	6	(("20030224792") or ("20030232615") or ("20040005878") or ("20040030791") or ("20040085959") or ("20040087307")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:33
S79	5	(("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:35
S80	937	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:52
S81	13696	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:59
S82	11027	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:00

		over)) switch$3 dual))				
S83	63	S82 AND ((H04W36/0016).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:01
S84	4063	((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with wimax)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:03
S85	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 11:08
S86	31862	"802.11" with wifi	US-PGPUB; USPAT	OR	OFF	2018/10/22 11:20
S87	233	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with ((session near3 invitation$1) ims)	US-PGPUB; USPAT	OR	OFF	2018/10/22 12:04
S88	0	("2004017173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/22 14:24
S89	0	S88 and (stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4))	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:24
S90	1417	(stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4)) and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:25
S91	26011	((wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual))	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:43
S92	114	S91 and (boat ship) and airplane and automobile	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:44
S93	17	(wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with stacks	US-PGPUB; USPAT	OR	OFF	2018/10/22 17:08
S94	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:53
S95	1	("20040203788").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:57

10/23/2018 5:09:30 PM
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Doc code: IDS
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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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	1	20040153676	A1	2004-08-05	Anton W. Krantz	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-12-12
Name/Print	Jonathan O. Owens	Registration Number	37902

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	34569407
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	12-DEC-2018
Filing Date:	14-MAR-2018
Time Stamp:	19:15:49
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_12_12_2018.pdf	612208 b0b4093e1d51d79017acfbfb7f895ce2cc1e7aaa	no	4

Warnings:

Information:	
Total Files Size (in bytes):	612208

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (**Not for submission under 37 CFR 1.99)**		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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	1	20090191864	A1	2209-07-30	Gary P. Mousseau	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-12-28
Name/Print	Jonathan O. Owens	Registration Number	37902

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Electronic Acknowledgement Receipt

EFS ID:	34719219
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	28-DEC-2018
Filing Date:	14-MAR-2018
Time Stamp:	16:52:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_12_28_2018.pdf	612212 54743c08f17a07cd4375fc7c6b21a973f33809b1	no	4

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Total Files Size (in bytes):	612212

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National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT
Attorney Docket No.: HAVA-00507

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Group Art Unit: 2649
Vasudevan Ganesan	Examiner: Nguyen, Tu X.
Application No.: 15/921,275	
Filed: March 14, 2018	**AMENDMENT AND RESPONSE TO OFFICE ACTION MAILED ON November 6, 2018**
For: **MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS**	162 North Wolfe Road Sunnyvale, California 94086 (408) 530-9700
	Customer No. 28960

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENTS

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 10 of this paper.

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

1. (currently amended) A device comprising:

a switching system to switch operation between a first communication module and a second communication module, wherein if a context changes for known networks or a new network is detected with a more favorable context, a previously established communication automatically switches accordingly, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

2. (canceled)

3. (original) The device of claim 1, wherein when the context comprises signal strength characteristics, if a signal monitor detects that a Wi-Fi signal level is equal to or greater than a predefined threshold value, a previously established communication continues without switching.

4. (original) The device of claim 1 wherein a wireless network to communicate with the second communication module is selected from the group consisting of 2G, 3G, 4G, 5G, LTE, and WiMAX.

5. (original) The device of claim 1 wherein the context comprises signal strength characteristics.

6. (original) The device of claim 1 wherein the context comprises at least one of radio signal strength, available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information,

knowledge, quality of service information, service level agreement information, and history information.

7. (original) The device of claim 1 wherein automatic switching is between bearers on a same network.

8. (original) The device of claim 7 wherein automatic switching comprises sending data on a first bearer and data on a second bearer.

9. (original) The device of claim 1 wherein the previously established communication comprises: a cellular communication, a VoIP communication / session, a voice communication / session, a video communication / session, a multimedia communication /session, a data communication / session, a SIP or IMS based communication and/or a WiFi communication.

10. (original) The device of claim 1 wherein the previously established communication is secure or unsecure.

11. (original) The device of claim 1 wherein the previously established communication is proprietary or standard.

12. (original) The device of claim 1 wherein monitoring, detecting, and/or switching are based on the context are implemented using a distributed system.

13. (currently amended) A method comprising:
detecting a first context;
detecting a second context; and

automatically switching, with a server, a communication in progress via a wireless network to a communication via a network based on the second context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

14. (original) The method of claim 13, wherein the communication comprises a transmission of content.

15. (original) The method of claim 13, wherein the communication comprises a data exchange.

16. (original) The method of claim 13, wherein the communication comprises at least one of a telephone call, a voice call/communication, or duplex streaming/exchange.

17. (original) The method of claim 16, wherein the communication comprises a telephone call transformed into a second communication.

18. (original) The method of claim 17, wherein the second communication comprises at least one of a voice call/communication or duplex streaming/exchange.

19. (original) The method of claim 13, wherein the communication comprises a transmission of content.

20. (original) The method of claim 13, wherein the communication comprises a secure data exchange.

21. (original) The method of claim 13, wherein the communication comprises an unsecured data exchange.

22. (original) The method of claim 13, wherein the communication comprises data streaming.

23. (original) The method of claim 13, wherein the communication comprises video exchange, streaming or video calling.

24. (currently amended) A method comprising:
determining a first context;
determining a second context; and
automatically switching, with a server, a communication in progress via a first network to a communication via a second network based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the second communication module to change state from the stand-by mode to an active mode before the communication is switched to the communication module.

25. (original) The method of claim 24 wherein at least one of the first network and the second network is a wired network.

26. (currently amended) A method comprising:
determining a first context;
determining a second context; and
automatically switching a communication in progress via a first device to a communication via a second device based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, a communication module of the second device changes state from a sleep mode to a stand-by mode, and the communication module of the second device changes state from the stand-by mode to an active mode before the communication is switched to the communication module of the second device.

27. (original) The method of claim 26 wherein the method is stored, in part, within a mobile communication device.

28. (original) The method of claim 26 wherein the method is implemented, in part, on a network-based device.

29. (original) The method of claim 26 wherein the method is implemented, in part, on a switch and/or router.

30. (original) The method of claim 26 wherein the method is implemented, in part, on a network-based switch and/or router.

31. (original) The method of claim 26 wherein the method is implemented, in part, on an access point.

32. (original) The method of claim 26 wherein the method is implemented, in part, on a base station.

33. (original) The method of claim 26 wherein the method is implemented on a transportation device selected from the group consisting of an automobile, a ship, a boat, and an airplane.

34. (original) The method of claim 26 wherein the method is implemented in software, firmware and/or hardware.

35. (currently amended) A server device comprising:

a switching system to switch operation between a communication module and a Wi-Fi communication module, wherein based on a first context and a second context, a communication automatically switches accordingly, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the switching system causes the Wi-Fi communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the Wi-Fi communication module to change state from the stand-by

mode to an active mode before the communication is switched to the Wi-Fi communication module.

36. (currently amended) A device comprising:

a switching system to switch operation between a first communication module and a second communication module, wherein during an established communication if a preferable context is determined, the established communication is switched to a second communication over a network, wherein the preferable context is found in a set of known networks or in a newly discovered network, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

37. (original) The device of claim 36 wherein the network is operated by a different network provider.

38. (original) The device of claim 36 wherein the network includes a plurality of access points, and the established communication is switched between the plurality of access points.

39. (canceled)

40. (original) The device of claim 36 wherein the device comprises a terminal, a mobile device, a sensor, an access point, and/or a controller device.

41. (currently amended) A method comprising:

establishing a first communication link between a mobile communication device and an end destination device, wherein the first communication link comprises a first wireless communication link between the mobile communication device and a first wireless network;

monitoring a signal strength of the first wireless communication link;

when the signal strength drops below a threshold, notifying an interface server and establishing a second communication link between the interface server and the end destination device without disrupting the first communication link;

notifying the mobile communication device to terminate transmission over the first communication link; and

re-directing the second communication link from the interface server to another mobile communication device, thereby establishing a second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

42. (original) The method of claim 41 wherein re-directing is known by preferences and attached or attachable to the network.

43. (currently amended) A method comprising:

monitoring a context of a first wireless communication link;

when a network is detected as available with a second wireless communication link with a context preferable to the first wireless communication link, notifying an interface and establishing the second communication link between the interface and an end destination device without disrupting the first communication link; and

re-directing the second communication link from the interface to a mobile communication device, thereby establishing the second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

44. (original) The method of claim 43 wherein a function of the interface is distributed.

45. (original) The method of claim 43 wherein the context comprises at least one of radio signal strength, available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information,

knowledge, quality of service information, service level agreement information, and history information.

46. (original) The method of claim 43 wherein the method is distributed across a plurality of network components.

47. (original) The method of claim 43 wherein the method is utilized in a peer-to-peer communication.

REMARKS

Applicants respectfully request further examination and reconsideration in view of the arguments set forth fully below. Claims 1-47 have been rejected. By the above amendments, Claims 1, 13, 24, 26, 35, 36, 41 and 43 have been amended, and Claims 2 and 39 have been canceled. Accordingly, Claims 1, 3-38 and 40-47 are currently pending.

Rejections Under 35 U.S.C. § 112, first paragraph

Within the Office Action, Claim 39 has been rejected under 35 U.S.C. § 112, first paragraph as failing to comply with the written description requirement. Applicants respectfully disagree. However, to further prosecution, Claim 39 has been canceled by the above amendments.

Rejections Under 35 U.S.C. § 103

Within the Office Action, Claims 1-3, 5-8, 10-18, 20-24, 26-32, 34-38 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2005/0059400 by Jagadeesan et al. (hereinafter Jagadeesan) in view of U.S. Patent Application Publication No. 2004/0153676 by Krantz et al. (hereinafter Krantz). Applicants respectfully disagree.

Specifically, by the above amendments, the independent Claims have been amended to include the limitation (or a similar variant): wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

Jagadeesan is directed to a method and system for triggering handoff of a call between networks. [Jagadeesan, Abstract] However, Jagadeesan does not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

Krantz teaches a method and system for managing power consumption in a portable computing device having a network interface module is presented. A power management module

receives inputs from other modules and determines when the network interface module is to be put in a doze state for a predetermined number of beacon intervals to conserve power consumption in the network interface module. The network interface module in a device that is associated with a network is put in the doze state after an event has occurred including when a scan has been performed, after a delayed sleep timer has expired, and after a beacon transmission has been completed and no traffic is buffered for the device. The delayed sleep-time is set based on the estimated round trip time of a packet. However, Krantz does not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

In contrast to the combination of Jagadeesan and Krantz, the presently claimed invention teaches a mobile communication module configured to switch between a cellular communication module and a Wi-Fi communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

The independent Claim 1 is directed to a device. The device of Claim 1 comprises a switching system to switch operation between a first communication module and a second communication module, wherein if a context changes for known networks or a new network is detected with a more favorable context, a previously established communication automatically switches accordingly, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. For at least these reasons, the independent Claim 1 is allowable over the teachings of Jagadeesan, Krantz and their combination.

By the above amendments, Claim 2 has been canceled. Claims 3, 5-8 and 10-12 are all dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 3, 5-8 and 10-12 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 13 is directed to a method. The method of Claim 13 comprises detecting a first context, detecting a second context and automatically switching, with a server, a communication in progress via a wireless network to a communication via a network based on the second context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 13 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 14-18 and 20-23 are all dependent upon the independent Claim 13. As discussed above, the independent Claim 13 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 14-18 and 20-23 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 24 is directed to a method. The method of Claim 24 comprises determining a first context, determining a second context and automatically switching, with a server, a communication in progress via a first network to a communication via a second network based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the second communication module to change state from the stand-by mode to an active mode before the communication is switched to the communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the

server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the second communication module to change state from the stand-by mode to an active mode before the communication is switched to the communication module. For at least these reasons, the independent Claim 24 is allowable over the teachings of Jagadeesan, Krantz and their combination.

The independent Claim 26 is directed to a method. The method of Claim 26 comprises determining a first context, determining a second context and automatically switching a communication in progress via a first device to a communication via a second device based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, a communication module of the second device changes state from a sleep mode to a stand-by mode, and the communication module of the second device changes state from the stand-by mode to an active mode before the communication is switched to the communication module of the second device. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, a communication module of the second device changes state from a sleep mode to a stand-by mode, and the communication module of the second device changes state from the stand-by mode to an active mode before the communication is switched to the communication module of the second device. For at least these reasons, the independent Claim 26 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 27-32 and 34 are all dependent upon the independent Claim 26. As discussed above, the independent Claim 26 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 27-32 and 34 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 35 is directed to a server device. The server device of Claim 35 comprises a switching system to switch operation between a communication module and a Wi-Fi communication module, wherein based on a first context and a second context, a communication automatically switches accordingly, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the switching system causes the Wi-Fi communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the Wi-Fi communication module to change state from the stand-by mode to an active mode before the communication is switched to the Wi-Fi communication

module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the Wi-Fi communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the Wi-Fi communication module to change state from the stand-by mode to an active mode before the communication is switched to the Wi-Fi communication module. For at least these reasons, the independent Claim 35 is allowable over the teachings of Jagadeesan, Krantz and their combination.

The independent Claim 36 is directed to a device. The device of Claim 36 comprises a switching system to switch operation between a first communication module and a second communication module, wherein during an established communication if a preferable context is determined, the established communication is switched to a second communication over a network, wherein the preferable context is found in a set of known networks or in a newly discovered network, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. For at least these reasons, the independent Claim 36 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 37, 38 and 40 are all dependent upon the independent Claim 26. As discussed above, the independent Claim 36 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 37, 38 and 40 are all also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 2005/0025164 by Kavanagh et al. (hereinafter Kavanagh). Applicants respectfully disagree.

Claim 4 is dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 4 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 9 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 2006/0105766 by Azada et al. (hereinafter Azada). Applicants respectfully disagree.

Claim 9 is dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 9 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 33 and 39 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 20060009219 by Jaakola et al. (hereinafter Jaakola). Applicants respectfully disagree.

By the above amendments, Claim 39 has been canceled. Claim 33 is dependent upon the independent Claim 26. As discussed above, the independent Claim 26 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 33 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 39 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 2006/0010272 by Solomon et al. (hereinafter Solomon). Applicants respectfully disagree.

By the above amendments, Claim 39 has been canceled.

Within the Office Action, Claims 41 and 42 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of U.S. Patent Application Publication No. 2004/0203788 by Fors et al. (hereinafter Fors). Applicants respectfully disagree.

As described above, Jagadeesan does not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

Fors teaches an access gateway (214) and a dual mode mobile station (201) that enable such handoffs. The MS provides information to the access gateway so that it can initiate a handoff with the serving cellular MSC (251). By triggering handoffs in this manner, cellular networks need not have special information about non-cellular networks to support handoffs. Instead, dual mode MSs can determine when a handoff to a non-cellular network is preferred and

request a handin (302) from the non-cellular network. [Fors, Abstract] However, Fors does not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

The independent Claim 41 is directed to establishing a first communication link between a mobile communication device and an end destination device, wherein the first communication link comprises a first wireless communication link between the mobile communication device and a first wireless network, monitoring a signal strength of the first wireless communication link, when the signal strength drops below a threshold, notifying an interface server and establishing a second communication link between the interface server and the end destination device without disrupting the first communication link, notifying the mobile communication device to terminate transmission over the first communication link and re-directing the second communication link from the interface server to another mobile communication device, thereby establishing a second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Fors and their combination do not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 41 is allowable over the teachings of Jagadeesan, Fors and their combination.

Claim 42 is dependent upon the independent Claim 41. As discussed above, the independent Claim 41 is allowable over Jagadeesan, Fors and their combination. Accordingly, Claims 42 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 43-47 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Fors and further in view of Krantz. Applicants respectfully disagree.

As described above, Jagadeesan, Fors, Krantz and their combination do not teach wherein upon activation of a timer, the interface causes a communication module to change state from a

sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

The independent Claim 43 is directed to a method. The method of Claim 43 comprises monitoring a context of a first wireless communication link, when a network is detected as available with a second wireless communication link with a context preferable to the first wireless communication link, notifying an interface and establishing the second communication link between the interface and an end destination device without disrupting the first communication link and re-directing the second communication link from the interface to a mobile communication device, thereby establishing the second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Fors, Krantz and their combination do not teach wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 43 is allowable over the teachings of Jagadeesan, Fors, Krantz and their combination.

Claim 44-47 is dependent upon the independent Claim 43. As discussed above, the independent Claim 43 is allowable over Jagadeesan, Fors, Krantz and their combination. Accordingly, Claims 44-47 is also allowable as being dependent upon an allowable base claim.

Applicants respectfully submit that the claims, as amended, are now in a condition for allowance, and allowance at an early date would be appreciated. Should the Examiner have any questions or comments, they are encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: February 7, 2019

By: /Jonathan O. Owens/
Jonathan O. Owens
Reg. No.: 37,902
Attorneys for Applicant

Electronic Patent Application Fee Transmittal

Application Number:	15921275
Filing Date:	14-Mar-2018
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Filer:	Jonathan O Owens
Attorney Docket Number:	HAVA-00507

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension - 1 month with $0 paid	2251	1	100	100
Miscellaneous:				
		Total in USD ($)		**100**

Electronic Acknowledgement Receipt	
EFS ID:	35085478
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	07-FEB-2019
Filing Date:	14-MAR-2018
Time Stamp:	12:26:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$100
RAM confirmation Number	020719INTEFSW12270500
Deposit Account	081275
Authorized User	Jonathan Owens
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows: 37 CFR 1.16 (National application filing, search, and examination fees) 37 CFR 1.17 (Patent application and reexamination processing fees)	

37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Response_2_7_2019.pdf	147031 2c10d844a06739a1b7281c8d98d5c13776bfa257	yes	18
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	9	
	Applicant Arguments/Remarks Made in an Amendment		10	18	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30570 4729a3a3b4b290ed62ad38241d799a0a766d9bf2	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	177601		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

<u>New Applications Under 35 U.S.C. 111</u>
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
<u>National Stage of an International Application under 35 U.S.C. 371</u>
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
<u>New International Application Filed with the USPTO as a Receiving Office</u>
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/921,275	Filing Date 03/14/2018	☐ To be Mailed

ENTITY: ☐ LARGE ☑ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $50 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $230 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	02/07/2019	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 45	Minus	** 47	= 0		x $50 =	0
	Independent (37 CFR 1.16(h))	* 8	Minus	*** 8	= 0		x $230 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	0

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/JULIET MCMILLAN/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

28960 7590 02/26/2019

HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

EXAMINER	
NGUYEN, TU X	

ART UNIT	PAPER NUMBER
2649	

MAIL DATE	DELIVERY MODE
02/26/2019	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	**Application No.** 15/921,275	**Applicant(s)** Ganesan et al.	
	Examiner TU X NGUYEN	**Art Unit** 2649	**AIA Status** No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 19 February 2019.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☑ This action is **FINAL.** 2b) ☐ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 1,3-38 and 40-47 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 1-47 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☑ The drawing(s) filed on 14 March 2018 is/are: a)☑ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

Applicant's arguments filed 2/07/19 have been fully considered but they are not persuasive.

Applicants argue that Krantz does not teach wherein upon activation of a timer, the switching system cause the second communication module to change state from a sleep mode to a stand-by-mode, and switching system causes the second communication module to change from the standby-by mode to active mode. The Examiner disagrees.

Karantz discloses a process the network interface module from sleep mode to idle mode upon activate a timer listening beacon intervals (par.10 “listening beacon intervals”), and if there are transmitting and receiving data packets between devices, the communication module to change from stand-by mode to active mode (par.023 “”current network interface modules stay remain in a high power state”).

Claim Rejections - 35 USC § 103

The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 3, 5-8, 10-18, 20-24, 26-32, 34-38 and 40 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400, IDS dated 3/30/18) in view of Krantz et al. (US Pub. 2004/0153676).

Regarding claims 1 and 36, Jagadeesan et al. discloses a device comprising:

a switching system if a context changes for known networks (par.017 "a subscription or an agreement may be provided by cellular network 14", par.018 "wireless communications in a designated area") or a new network (par.021 "WLAN...coffee shops airports, restaurants hotels"), is detected with a more favorable context (par.004, 032-033, LQI, RSSI), a previously established communication automatically switches accordingly (par.008 "automatically handoff the call from the cellular network to the WLAN and vice versa").

Jagadeesan et al. discloses mobile device includes dual-mode technology to support the transition from one network to another (par.025 "dual mode functionality such that it may support multiple different communication modes, such as 802.11 and cellular protocols); however, Jagdeesan et al. fails to teach upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module..

Krantz et al. discloses wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is

switched to the second communication module (par.10, par.23). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of Jagadeesan et al. with the above teaching of Krantz in order to provide separate communication modules having different saving power settings for different state of communication (etc, sleep mode, scanning mode and active mode).

Regarding claim 3, the modified Jagadeesan et al. discloses when the context comprises signal strength characteristics, if a signal monitor detects that a Wi-Fi signal level is equal to or greater than a predefined threshold value, a previously established communication continues without switching (Jagadeesan, elements 108-114).

Regarding claim 5, the modified Jagadeesan et al. discloses the context comprises signal strength characteristics (Jagadeesan, par.005).

Regarding claim 6, the modified Jagadeesan et al. discloses the context comprises at least one of radio signal strength, available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information, knowledge, quality of service information (Jagadeesan, par.033 LQI, SNR, BER EVM, demodulation quality indicator) service level agreement information, and history information.

Regarding claims 7-8, the modified Jagadeesan et al. fails to disclose automatic switching is between bearers on a same network (par.018 “MSC 20 may monitor the movement and the transfer of a wireless communication from one cell to another cell”).

Regarding claims 10 and 20-21, the modified Jagadeesan et al. discloses the previously established communication is secure (par.014 “WLAN 16 may comprise a private network”) or unsecure (par.021 “public places as coffee shops”).

Regarding claim 11, the modified Jagadeesan et al. discloses the previously established communication is proprietary or standard (par.021 "IEEE 802.11 standard").

Regarding claim 12, the modified Jagadeesan et al. discloses monitoring, detecting, and/or switching are based on the context are implemented using a distributed system (Jagadeesan, par.023 "IP data network 17 may be distributed across multiple cities and geographic regions").

Regarding claims 13, 24, 26 and 35, the modified Jagadeesan et al. discloses everything as claim 1 above. More specifically the modified Jagadeesan discloses a second context (Jagadeesan, fig.3 element 106 "quality of second link"); a server (Jagadeesan, par.023 "IP data network 17 enables communication between endpoints coupled to cellular network 14, WLAN and IP data network 17").

Regarding claims 14 and 19, the modified Jagadeesan et al. discloses the communication comprises a transmission of content (Jagadeesan, par.016 video is implied to content).

Regarding claim 15, the modified Jagadeesan et al. discloses the communication comprises a data exchange (Jagadeesan, par.016 "data exchanges").

Regarding claim 16, the modified Jagadeesan et al. discloses the communication comprises at least one of a telephone call, a voice call/communication (Jagadeesan, par.024), or duplex streaming/exchange.

Regarding claim 17, the modified Jagadeesan et al. discloses the communication comprises a telephone call transformed into a second communication (Jagadeesan, par.004 "handing off a call between networks").

Regarding claim 18, the modified Jagadeesan et al. discloses the second communication comprises at least one of a voice call/communication (Jagadeesan, par.004-005) or duplex streaming/exchange.

Regarding claim 22, the modified Jagadeesan et al. discloses data streaming (Jagadeesan, par.024 video is implied to data streaming)

Regarding claim 23, the modified Jagadeesan et al. discloses the communication comprises video exchange, streaming or video calling (Jagadeesan, par.024 "video conference").

Regarding claim 27, the modified Jagadeesan et al. discloses method is stored, in part, within a mobile communication device (Jagadeesan, par.029).

Regarding claim 28, the modified Jagadeesan et al. discloses the method is implemented, in part, on a network-based device (par.020 "a base station controller may include management of radio channels in assisting in handover scenarios").

Regarding claims 29-30, the modified Jagadeesan et al. discloses the method is implemented, in part, on a switch and/or router (Jagadeesan, par.023).

Regarding claim 31, the modified Jagadeesan et al. discloses the method is implemented, in part, on an access point (Jagadeesan, fig.1 element 24, par.022 "access point 24…WLAN 16 may also include an access router").

Regarding claim 32, the modified Jagadeesan et al. discloses the method is implemented, in part, on a base station (Jagadeesan, par.018 "base station systems 22").

Regarding claim 34, the modified Jagadeesan et al. discloses the method is implemented in software (Jagadeesan, par.030), firmware and/or hardware.

Regarding claim 37, the modified Jagadeesan et al. discloses the network is operated by a different network provider (Jagadeesan, par.017 GSM, CDMA, TDMA).

Regarding claim 38, the modified Jagadeesan et al. discloses the network includes a plurality of access points, and the established communication is switched between the plurality of access points (par.021).

Regarding claim 40, the modified Jagadeesan et al. discloses the device comprises a terminal, a mobile device (Jagadeesan, par.004 “mobile station”), a sensor, an access point, and/or a controller device.

Claim 4 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and further in view of Kavanagh et al. (US Pub. 2005/0025164) and Maltsev et al. (US Pub. 2014/0204902).

Regarding claim 4, the modified Jagadeesan et al. discloses a wireless network to communicate with the second communication module is selected from the group consisting of 2G, 3G (Jagadeesan, par.017); however, the modified Jagadeesan et al. fails to teach 4G, 5G, LTE,and WiMAX.

Kavanagh et al. disclose WiMAX network (par.051). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Kavanagh et al. in order to provide handoff to other standard network such as WIMAX which provide IP connection.

Maltsev et al. discloses 4G, 5G and LTE (par.024). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Maltsev et al. in order to provide handoff to latest network technologies. Maltsev et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claim 9 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and further in view of Azada et al. (US Pub. 2006/0105766).

Regarding claim 9, the modified Jagadeesan et al. discloses the previously established communication comprises: a cellular communication, a VoIP communication / session (par.034), a voice communication / session, a video communication / session (par.016), a data communication / session (par.016 "voice or data exchanges"), SIP session (Jagadeesan, par.023 IP phone is inherently included SIP session) or a WiFi communication (par.005 "IEEE 802.11 protocol"). However, the modified Jagadeesan fails to teach multimedia communication, SIP or IMS based communication.

Azada et al. discloses multimedea communication, SIP or IMS based communication (par.016 "SIP session", par.043 "IMS network", par.021 "multimedia services"). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Azada et al. in order to provide an enhanced communication

both existing wireless service providers and other service providers just entering the wireless arena as suggested by Azada (par.007). Azada et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claim 33 is rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Krantz et al. (US Pub. 2004/0153676) and Jaakola et al. (US Pub. 2006/0009219).

Regarding claim 33, the modified Jadadeesan et al. fails to teach the method is implemented on a transportation device selected from the group consisting of an automobile, a ship, a boat, and an airplane.

Jaakola et al. discloses a transportation device selected from the group consisting of an automobile, a ship, a boat, and an airplane (par.017). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Jaakola et al. in order to provide a mobile telephone can be carried by an individual who is moving as suggested by Jaakola et al.. Jaakola et al. references intervenes filling date between this current Patent application and the CIP Patent application of 15/480,293.

Claims 41-42 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Fors et al. (US Pub. 2004/0203788).

Regarding claim 41, Jagadeesan et al. discloses a method comprising:

establishing a first communication link between a mobile communication device and an end destination device, wherein the first communication link comprises a first wireless communication link between the mobile communication device and a first wireless network (par.004 "actively connected with WLAN");

monitoring a signal strength of the first wireless communication link (par.005 "monitoring the quality of the first link";

when the signal strength drops below a threshold (par.004 "the first link is less than a handoff trigger threshold"), notifying an interface server (par.023 IP data network 17 enables communication between endpoints coupled to cellular network 14, WLAN and IP data network") and establishing a second communication link between the interface server and the end destination device without disrupting the first communication link (par.036 This enables mobile station 12 to be connected to both WLAN network 16 and cellular network 14 at the same time during handoff and ensures that a connection is made");

re-directing the second communication link from the interface server to another mobile communication device, thereby establishing a second wireless communication link between the mobile communication device and a second wireless network (par.036 "handoff" is implied to "re-directing").

Jagadeesan fails to teach notifying an interface server to establish a second communication and the server notifying the mobile communication device to terminate transmission over the first communication link.

Fors et al. discloses notifying an interface server to establish a second communication (par.007 the BS generates a Handoff Required message....the source MSC then identifies the target BS") and the server notifying the mobile communication device to terminate transmission over the first communication link (par.009 "the IS95_Handoff Direction Message instructs the MS to switchover to the target cell/BS"). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Fors et al. in order to provide handoff procedures between the mobile station and communication networks.

Regarding claim 42, the modified Jagadeesan et al. discloses re-directing is known by preferences (par.005 "the existing list of neighboring cells to include cells of the other technology") and attached or attachable to the network.

Claims 43-47 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Jagadeesan et al. (US Pub. 2005/0059400) in view of Fors et al. (US Pub. 2004/0203788) and further in view of Krantz et al. (US Pub. 2004/0153676).

Regarding claim 43, the modified Jagadeesan et al. discloses everything as claim 41 above; however, the modified Jagadeesan fails to teach establishing the second wireless communication link between the mobile communication device.

Krantz et al. disclose establishing the second wireless communication link between the mobile communication device (par.030). Therefore, it would have been obvious to one of ordinary skill in the art before the effective filling date to modify the system of the modified Jagadeesan et al. with the above teaching of Karntz et al. in order to provide the mobile device may also be part of a peer-to-peer network whichever network is available in the area.

Regarding claim 44, the modified Jagadeesan et al. discloses a function of the interface is distributed (Jagadeesan, par.,023 "IP data network 17 may be distributed across multiple cities and geographic regions").

Regarding claim 45, the modified Jagadeesan et al. discloses the context comprises at least one of radio signal strength (Jagadeesan, par.005 "a received signal strength"), available speed/bandwidth, delays, congestion, power requirements, availability of encryption, cost information, preference information, policy information, knowledge,quality of service information, service level agreement information, and history information.

Regarding claim 46, the modified Jagadeesan et al. discloses the method is distributed across a plurality of network components (par.023 switches, routers,hubs, call managers, endpoints, gateways and other suitable network components").

Regarding claim 47, the modified Jagadeesan et al. discloses the method is utilized in a peer-to-peer communication (Krantz, par.030).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571)272-7883. The examiner can normally be reached on 8AM-5PM Eastern Time.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, Applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, SPE can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TU X NGUYEN/
Primary Examiner, Art Unit 2649

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	Art Unit
	TU X NGUYEN	2649

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

CLAIMS

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	10/23/2018	02/25/2019							
	1	✓	✓							
	2	✓	-							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
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	35	✓	✓							
	36	✓	✓							
	37	✓	✓							
	38	✓	✓							
	39	✓	-							
	40	✓	✓							
	41	✓	✓							
	42	✓	✓							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	Art Unit
	TU X NGUYEN	2649

CLAIM		DATE								
Final	Original	10/23/2018	02/25/2019							
	43	✓	✓							
	44	✓	✓							
	45	✓	✓							
	46	✓	✓							
	47	✓	✓							

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	Art Unit
	TU X NGUYEN	2649

CPC - Searched*		
Symbol	Date	Examiner
H04W36/0016	02/25/2019	TN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
455	436,437,438,439,442,444	02/25/2019	tn

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Search EAST, history	02/25/2019	TN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

/TU X NGUYEN/ Primary Examiner, Art Unit 2649	

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2649
Examiner Name	Tu X. Nguyen
Attorney Docket Number	HAVA-00507

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/T.X.N/	1	20040153676	A1	2004-08-05	Anton W. Krantz	

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Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2] i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

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Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

	1		

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EXAMINER SIGNATURE

Examiner Signature	/TU X NGUYEN/	Date Considered	02/25/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-12-12
Name/Print	Jonathan O. Owens	Registration Number	37902

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2649
Examiner Name	Tu X. Nguyen
Attorney Docket Number	HAVA-00507

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/T.X.N/	1	20090191864	A1	2209-07-30	Gary P. Mousseau	

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	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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EXAMINER SIGNATURE

Examiner Signature	/TU X NGUYEN/	Date Considered	02/25/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

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	Art Unit	2649
	Examiner Name	Tu X. Nguyen
	Attorney Docket Number	HAVA-00507

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2018-12-28
Name/Print	Jonathan O. Owens	Registration Number	37902

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("20090191864").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/25 11:46
L2	0	("20090191864,20040153676").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/25 11:47
S1	1	("20050059400").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:49
S2	4	(("7991399") or ("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:53
S3	3	(("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S4	2	(("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S5	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:55
S6	1453	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin switch$3 automatic$4 module$1 transceiver$1 profile memor$3 storag$3 chang$4 (hand near2 (over off)) connect$4 select$3 histo$3) with (greater higher equal$2 ping second third strong$4)	US-PGPUB; USPAT	OR	OFF	2018/01/05 20:10
S7	4707	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long near2 range)) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:14
S8	4747	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long	US-PGPUB;	OR	OFF	2018/01/07 14:14

		near2 range)) with (wimax wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	USPAT			
S9	1511	S8 and ((second multipl$4 plura$4 third) near3 (threshold$1 level$1 margin$1 strength))	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:32
S10	5	(("20020152305") or ("20030133421") or ("20040076144") or ("20040083360") or ("20040095916")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:46
S11	9	(("6009328") or ("6165737") or ("6195543") or ("0647413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:54
S12	11	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119") or ("7382763") or ("7398088") or ("7483984") or ("7512796") or ("8041360")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:57
S13	8	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:04
S14	10	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766") or ("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("2003021791")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:25
S15	10	(("20030224792") or ("20030232615") or ("2004005878") or ("20040030791") or ("20040085959") or ("20040087307") or ("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:29
S16	11	(("20040174880") or ("20040203666") or ("20040203788") or ("20040203802") or ("20040204097") or ("20040218575") or ("20040229618") or ("20050044138") or ("20050059400") or ("20050090259") or ("20050147049")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 07:22
S17	11	(("20050149740") or ("20060040711") or ("20060050663") or ("20060050687") or ("20060080423") or ("20060146767") or ("20060234678") or ("20060291455") or ("20070076665") or ("20070112948") or ("20070124490")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:35
S18	11	(("20070249390") or ("20090070489") or ("20100074228") or ("20110010282") or ("20060050721") or ("20030053632") or ("20040141484") or ("20040176128") or ("20040192294") or ("20040246990") or ("20040181811")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:42
S19	1	("20030058876").PN.	US-PGPUB; USPAT;	OR	OFF	2018/01/08 13:47

			USOCR			
S20	30135	(threshold$3 with (second third fourth)) and (handoff handover (hand near2 (off over)) roam$3 switch$4) and ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") and (wwan cellular wan cdma gsm umts tdma licen$4)	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:10
S21	2400	(threshold$3 with (second third fourth)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:14
S22	1965	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:30
S23	1	"20040030791"	US-PGPUB; USPAT	OR	OFF	2018/03/29 13:09
S24	4	(("9648538") or ("9125128") or ("8467789") or ("7991399")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:39
S25	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:58
S26	0	("sctpadjstack$1").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 09:42
S27	50	sctp adj stack$1	US-PGPUB; USPAT	OR	OFF	2018/03/30 09:42
S28	0	("2004017173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 12:21
S29	1	("20040170173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 12:21
S30	2120	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S31	13	S30 and (ganesan vasudevan).inv.	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S32	1	("20040030791").PN.	US-	OR	OFF	2018/06/13

			PGPUB; USPAT; USOCR			06:04
S33	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/06/13 06:38
S34	22501	(sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3) with (wlan wifi "wi-fi" "802.11" (short near2 range)) with (wan wwan cell$5 macro (long near2 range))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:02
S35	12680	S34 and ((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:06
S36	2250	S35 AND ((H04W88/06 OR H04W36/14 OR H04W76/15 OR H04W8/18 OR H04W48/18 OR H04W76/25 OR H04W48/20 OR H04W52/02 OR H04W52/0245 OR H04W92/20).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:11
S37	380	S36 and timer$1 and threshold$1	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:12
S38	238	S36 and (timer$1 near3 (incre$5 activat$4 initiat$3 start$3 trigger$4))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:18
S39	5	(("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/07 09:44
S40	270610	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (threshold strength power strong$3 level$1 amplitude$1)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:49
S41	9354	S40 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53
S42	0	S41 and @ad< "01012004"	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53
S43	4434	S41 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:54
S44	130788	S40 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:21
S45	5400	S44 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:23
S46	2603	S45 and (455/$).ccls.	US-	OR	OFF	2018/09/07

			PGPUB; USPAT			10:23
S47	67699	S44 and ((tim$4 duration$1 period$5 interval$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:40
S48	3459	S47 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41
S49	1572	S48 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41
S50	241101	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S51	253563	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (standby idl$3 sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S52	24302	S51 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S53	1195	S52 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S54	458	S53 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:57
S55	447883	((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi")) and ((sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3) with (processor$1 interfac$3 transceiver$1 wifi "802.11" bluetooth module$1 "tx/rx"))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:22
S56	141085	S55 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:24
S57	25168	S56 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:26
S58	3184	S57 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:27

S59	37162	(cellular wwan wan gsm umts cdma tdma gprs wifi "wi-fi" "802.11" wlan (local near2 wireless)) with (module$1 transceiver session control$4 process$4 circuit$3 section) with (off turnoff sleep wake$4 standby passiv$2 activat$3 deactivat$5)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:33
S60	1863	S59 and (handover handoff (hand near2 (over off))) and ((least conserv$5 sav$5 consum$5) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:36
S61	5388	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:40
S62	5736	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5 extend$3 life) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:41
S63	5731	S62 and (power level$1 strength amplitude margin threshold$1)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:43
S64	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S65	0	("200500594000").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S66	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/11 09:18
S67	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 07:46
S68	1	("20050147049").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 07:48
S69	865	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 09:59
S70	5	(("20030163697") or ("20040052223") or ("20050135286") or ("20060003796") or ("20060141984")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:04
S71	5	(("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:06
S72	8	(("6009328") or ("6175737") or	US-	OR	OFF	2018/10/19

		("6195543") or ("6473413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	PGPUB; USPAT; USOCR			10:10
S73	6	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:15
S74	5	(("7382763") or ("7398088") or ("7483984") or ("7512796") or ("8041360")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:17
S75	9	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020085516") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:20
S76	6	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:30
S77	5	(("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("20030217091")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:31
S78	6	(("20030224792") or ("20030232615") or ("20040005878") or ("20040030791") or ("20040085959") or ("20040087307")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:33
S79	5	(("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:35
S80	937	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:52
S81	13696	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:59
S82	11027	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual))	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:00
S83	63	S82 AND ((H04W36/0016).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:01
S84	4063	((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with wimax)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:03
S85	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 11:08
S86	31862	"802.11" with wifi	US-PGPUB;	OR	OFF	2018/10/22 11:20

			USPAT			
S87	233	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with ((session near3 invitation$1) ims)	US-PGPUB; USPAT	OR	OFF	2018/10/22 12:04
S88	0	("2004017173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/22 14:24
S89	0	S88 and (stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4))	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:24
S90	1417	(stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4)) and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:25
S91	26011	((wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual))	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:43
S92	114	S91 and (boat ship) and airplane and automobile	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:44
S93	17	(wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with stacks	US-PGPUB; USPAT	OR	OFF	2018/10/22 17:08
S94	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:53
S95	1	("20040203788").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:57
S96	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:33
S97	1	("9125128").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:34
S98	1	("8467789").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
S99	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
S100	1	("20060105766").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 16:43
S101	234	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over))	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09

		switch$3 dual) with ((session near3 invitation$1) ims)				
S102	1	S101 and (vasu ganesan vasudevan maes stephane).inv.	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09
S103	1	("20050239498").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 17:13

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Doc code: IDS
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	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Nguyen, Tu X
	Attorney Docket Number	HAVA-00507

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	1	20020073226	A1	2002-06-13	Sridhar, Manickam R.	
	2	20030061206	A1	2003-03-27	Qian, Richard	
	3	20050259958	A1	2005-11-24	Johansson, Ivan	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
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	First Named Inventor	Vasudevan Ganesan
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[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Nguyen, Tu X
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2019-03-15
Name/Print	Jonathan O. Owens	Registration Number	37902

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EFS ID:	35435059
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	15-MAR-2019
Filing Date:	14-MAR-2018
Time Stamp:	12:21:54
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Information Disclosure Statement (IDS) Form (SB08)	IDS_3_15_2019.pdf	612321 770b0ddcc69094914 0b0e0bcc366c810305 339ff	no	4

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EFS ID:	35830697
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	25-APR-2019
Filing Date:	14-MAR-2018
Time Stamp:	14:01:22
Application Type:	Utility under 35 USC 111(a)

Payment information:

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Applicant Arguments/Remarks Made in an Amendment	Response_4_25_2019.pdf	131957 d7e285fde9499d86e9a07ec417e1261d4a88cd20	no	10

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PATENT
Attorney Docket No.: HAVA-00507

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	Group Art Unit: 2649
Vasudevan Ganesan	Examiner: Nguyen, Tu X.
Application No.: 15/921,275	
Filed: March 14, 2018	**AMENDMENT AND RESPONSE TO OFFICE ACTION MAILED ON February 26, 2019**
For: **MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS**	162 North Wolfe Road Sunnyvale, California 94086 (408) 530-9700
	Customer No. 28960

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Commissioner for Patents
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Alexandria, VA 22313-1450

AMENDMENTS

Remarks/Arguments begin on page 2 of this paper.

REMARKS

Applicants respectfully request further examination and reconsideration in view of the arguments set forth fully below. Claims 1, 3-38 and 40-47 have been rejected. Accordingly, Claims 1, 3-38 and 40-47 are currently pending.

Rejections Under 35 U.S.C. § 103

Within the Office Action, Claims 1-3, 5-8, 10-18, 20-24, 26-32, 34-38 and 40 have been rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2005/0059400 by Jagadeesan et al. (hereinafter Jagadeesan) in view of U.S. Patent Application Publication No. 2004/0153676 by Krantz et al. (hereinafter Krantz). Applicants respectfully disagree.

Within the Response to Argument section of the Office Action, it has been argued that Krantz teaches to process the network interface module from sleep mode to idle mode upon activate a timer listening to beacon intervals in paragraph 10 and the communication module changes from stand-by mode to active mode in paragraph 23. However, the presently claimed invention includes the limitation: wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. Although Krantz teaches, "[i]t is desirable to reduce the amount of time the network interface module is in a high-power state when not sending traffic or scanning," [Krantz, ¶ 23], Krantz does not specifically teach the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. Additionally, although Krantz teaches a sleep time and a power state, Krantz does not teach wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode.

Jagadeesan is directed to a method and system for triggering handoff of a call between networks. [Jagadeesan, Abstract] However, Jagadeesan does not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

Krantz teaches a method and system for managing power consumption in a portable computing device having a network interface module is presented. A power management module receives inputs from other modules and determines when the network interface module is to be put in a doze state for a predetermined number of beacon intervals to conserve power consumption in the network interface module. The network interface module in a device that is associated with a network is put in the doze state after an event has occurred including when a scan has been performed, after a delayed sleep timer has expired, and after a beacon transmission has been completed and no traffic is buffered for the device. The delayed sleep-time is set based on the estimated round trip time of a packet. However, Krantz does not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

In contrast to the combination of Jagadeesan and Krantz, the presently claimed invention teaches a mobile communication module configured to switch between a cellular communication module and a Wi-Fi communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module.

The independent Claim 1 is directed to a device. The device of Claim 1 comprises a switching system to switch operation between a first communication module and a second communication module, wherein if a context changes for known networks or a new network is detected with a more favorable context, a previously established communication automatically switches accordingly, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is

switched to the second communication module. For at least these reasons, the independent Claim 1 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 3, 5-8 and 10-12 are all dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 3, 5-8 and 10-12 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 13 is directed to a method. The method of Claim 13 comprises detecting a first context, detecting a second context and automatically switching, with a server, a communication in progress via a wireless network to a communication via a network based on the second context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 13 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 14-18 and 20-23 are all dependent upon the independent Claim 13. As discussed above, the independent Claim 13 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 14-18 and 20-23 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 24 is directed to a method. The method of Claim 24 comprises determining a first context, determining a second context and automatically switching, with a server, a communication in progress via a first network to a communication via a second network based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the second communication module to change state from the stand-by mode to an active

mode before the communication is switched to the communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the server causes a communication module to change state from a sleep mode to a stand-by mode, and the server causes the second communication module to change state from the stand-by mode to an active mode before the communication is switched to the communication module. For at least these reasons, the independent Claim 24 is allowable over the teachings of Jagadeesan, Krantz and their combination.

The independent Claim 26 is directed to a method. The method of Claim 26 comprises determining a first context, determining a second context and automatically switching a communication in progress via a first device to a communication via a second device based on the second detected context, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, a communication module of the second device changes state from a sleep mode to a stand-by mode, and the communication module of the second device changes state from the stand-by mode to an active mode before the communication is switched to the communication module of the second device. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, a communication module of the second device changes state from a sleep mode to a stand-by mode, and the communication module of the second device changes state from the stand-by mode to an active mode before the communication is switched to the communication module of the second device. For at least these reasons, the independent Claim 26 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 27-32 and 34 are all dependent upon the independent Claim 26. As discussed above, the independent Claim 26 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 27-32 and 34 are all also allowable as being dependent upon an allowable base claim.

The independent Claim 35 is directed to a server device. The server device of Claim 35 comprises a switching system to switch operation between a communication module and a Wi-Fi communication module, wherein based on a first context and a second context, a communication automatically switches accordingly, wherein automatically switching is based on detecting the second context being preferred over the first context within a set of known networks or from a newly discovered network, wherein upon activation of a timer, the switching system causes the Wi-Fi communication module to change state from a sleep mode to a stand-by mode, and the

switching system causes the Wi-Fi communication module to change state from the stand-by mode to an active mode before the communication is switched to the Wi-Fi communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the Wi-Fi communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the Wi-Fi communication module to change state from the stand-by mode to an active mode before the communication is switched to the Wi-Fi communication module. For at least these reasons, the independent Claim 35 is allowable over the teachings of Jagadeesan, Krantz and their combination.

The independent Claim 36 is directed to a device. The device of Claim 36 comprises a switching system to switch operation between a first communication module and a second communication module, wherein during an established communication if a preferable context is determined, the established communication is switched to a second communication over a network, wherein the preferable context is found in a set of known networks or in a newly discovered network, wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. As described above, Jagadeesan, Krantz and their combination do not teach wherein upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by mode, and the switching system causes the second communication module to change state from the stand-by mode to an active mode before a communication is switched to the second communication module. For at least these reasons, the independent Claim 36 is allowable over the teachings of Jagadeesan, Krantz and their combination.

Claims 37, 38 and 40 are all dependent upon the independent Claim 26. As discussed above, the independent Claim 36 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claims 37, 38 and 40 are all also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 4 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 2005/0025164 by Kavanagh et al. (hereinafter Kavanagh) and U.S. Patent Application Publication No. 2014/0204902 by Maltsev et al. (hereinafter Maltsev. Applicants respectfully disagree.

Claim 4 is dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 4 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 9 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 2006/0105766 by Azada et al. (hereinafter Azada). Applicants respectfully disagree.

Claim 9 is dependent upon the independent Claim 1. As discussed above, the independent Claim 1 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 9 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claim 33 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Krantz and further in view of U.S. Patent Application Publication No. 20060009219 by Jaakola et al. (hereinafter Jaakola). Applicants respectfully disagree.

Claim 33 is dependent upon the independent Claim 26. As discussed above, the independent Claim 26 is allowable over Jagadeesan, Krantz and their combination. Accordingly, Claim 33 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 41 and 42 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of U.S. Patent Application Publication No. 2004/0203788 by Fors et al. (hereinafter Fors). Applicants respectfully disagree.

As described above, Jagadeesan does not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

Fors teaches an access gateway (214) and a dual mode mobile station (201) that enable such handoffs. The MS provides information to the access gateway so that it can initiate a handoff with the serving cellular MSC (251). By triggering handoffs in this manner, cellular networks need not have special information about non-cellular networks to support handoffs. Instead, dual mode MSs can determine when a handoff to a non-cellular network is preferred and request a handin (302) from the non-cellular network. [Fors, Abstract] However, Fors does not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile

communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

The independent Claim 41 is directed to establishing a first communication link between a mobile communication device and an end destination device, wherein the first communication link comprises a first wireless communication link between the mobile communication device and a first wireless network, monitoring a signal strength of the first wireless communication link, when the signal strength drops below a threshold, notifying an interface server and establishing a second communication link between the interface server and the end destination device without disrupting the first communication link, notifying the mobile communication device to terminate transmission over the first communication link and re-directing the second communication link from the interface server to another mobile communication device, thereby establishing a second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Fors and their combination do not teach wherein upon activation of a timer, the mobile communication device causes a communication module to change state from a sleep mode to a stand-by mode, and the mobile communication device causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 41 is allowable over the teachings of Jagadeesan, Fors and their combination.

Claim 42 is dependent upon the independent Claim 41. As discussed above, the independent Claim 41 is allowable over Jagadeesan, Fors and their combination. Accordingly, Claims 42 is also allowable as being dependent upon an allowable base claim.

Within the Office Action, Claims 43-47 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Jagadeesan in view of Fors and further in view of Krantz. Applicants respectfully disagree.

As described above, Jagadeesan, Fors, Krantz and their combination do not teach wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module.

The independent Claim 43 is directed to a method. The method of Claim 43 comprises monitoring a context of a first wireless communication link, when a network is detected as available with a second wireless communication link with a context preferable to the first wireless communication link, notifying an interface and establishing the second communication link between the interface and an end destination device without disrupting the first communication link and re-directing the second communication link from the interface to a mobile communication device, thereby establishing the second wireless communication link between the mobile communication device and a second wireless network, wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. As described above, Jagadeesan, Fors, Krantz and their combination do not teach wherein upon activation of a timer, the interface causes a communication module to change state from a sleep mode to a stand-by mode, and the interface causes the communication module to change state from the stand-by mode to an active mode before a communication is switched to the communication module. For at least these reasons, the independent Claim 43 is allowable over the teachings of Jagadeesan, Fors, Krantz and their combination.

Claim 44-47 is dependent upon the independent Claim 43. As discussed above, the independent Claim 43 is allowable over Jagadeesan, Fors, Krantz and their combination. Accordingly, Claims 44-47 is also allowable as being dependent upon an allowable base claim.

Applicants respectfully submit that the claims, as amended, are now in a condition for allowance, and allowance at an early date would be appreciated. Should the Examiner have any questions or comments, they are encouraged to call the undersigned at (408) 530-9700 to discuss the same so that any outstanding issues can be expeditiously resolved.

Respectfully submitted,
HAVERSTOCK & OWENS LLP

Dated: April 25, 2019

By: /Jonathan O. Owens/
Jonathan O. Owens
Reg. No.: 37,902
Attorneys for Applicant

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

28960 7590 05/10/2019
HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

EXAMINER
NGUYEN, TU X

ART UNIT	PAPER NUMBER
2649	

DATE MAILED: 05/10/2019

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

TITLE OF INVENTION: MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	08/12/2019

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

28960 7590 05/10/2019
HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

TITLE OF INVENTION: MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	08/12/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TU X	2649	455-041200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑Issue Fee ❑Publication Fee (if required) ❑Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

IPR2025-00450 Page 00570

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

28960 7590 05/10/2019

HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

EXAMINER	
NGUYEN, TU X	

ART UNIT	PAPER NUMBER
2649	

DATE MAILED: 05/10/2019

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/921,275	Applicant(s) Ganesan et al.	
	Examiner TU X NGUYEN	Art Unit 2649	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to 2/7/19.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are 1,3-38 and 40-47 . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information , please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file areply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☐ Examiner's Amendment/Comment
6. ☑ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/TU X NGUYEN/
Primary Examiner, Art Unit 2649

DETAILED ACTION

Allowable Subject Matter

Claims 1, 3-38 and 40-47 are allowed.

The following is an examiner's statement of reasons for allowance:

Regarding claim 1, 13, 24, 26, 35-37, 41 and 43, Krantz et al. discloses a network interface upon active a timer from Doze mode (standby) to Off mode (sleep), fig.6 elements 602, 620, 622. However, Krantz et al. fails to teach "upon activation of a timer, the switching system causes the second communication module to change state from a sleep mode to a stand-by-mode", in linking with other subject matters in the claims.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Tu Nguyen whose telephone number is (571)272-7883. The examiner can normally be reached on 8AM-5PM Eastern Time.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an

interview, Applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, SPE can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/TU X NGUYEN/
Primary Examiner, Art Unit 2649

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	**Art Unit**
	TU X NGUYEN	2649

CPC						
Symbol					**Type**	**Version**
H04W	/	36	/	14	F	2013-01-01
H04W	/	48	/	18	I	2013-01-01
H04M	/	1	/	72522	I	2013-01-01
H04M	/	1	/	725	I	2013-01-01
H04W	/	52	/	0235	I	2013-01-01
H04W	/	48	/	16	I	2013-01-01
H04W	/	36	/	00837	I	2018-08-01
H04W	/	88	/	06	A	2013-01-01
H04W	/	84	/	042	A	2013-01-01
H04W	/	24	/	00	A	2013-01-01
H04M	/	2250	/	06	A	2013-01-01
H04M	/	1	/	2535	A	2013-01-01
Y02D	/	70	/	12	A	2018-01-01
Y02D	/	70	/	122	A	2018-01-01
H04W	/	84	/	12	A	2013-01-01
Y02D	/	70	/	00	A	2018-01-01
Y02D	/	70	/	146	A	2018-01-01
Y02D	/	70	/	23	A	2018-01-01
Y02D	/	70	/	142	A	2018-01-01
H04W	/	36	/	30	A	2013-01-01
Y02D	/	70	/	1262	A	2018-01-01
Y02D	/	70	/	144	A	2018-01-01
Y02D	/	70	/	14	A	2018-01-01
Y02D	/	70	/	126	A	2018-01-01
Y02D	/	70	/	10	A	2018-01-01
Y02D	/	70	/	20	A	2018-01-01
Y02D	/	70	/	124	A	2018-01-01

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	45	
/TU X NGUYEN/ Primary Examiner.Art Unit 2649	09 May 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20190509

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	**Art Unit**
	TU X NGUYEN	2649

CPC Combination Sets									
Symbol						**Type**	**Set**	**Ranking**	**Version**
	/		/						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	45	
/TU X NGUYEN/ Primary Examiner.Art Unit 2649	09 May 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20190509

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	**Art Unit**
	TU X NGUYEN	2649

INTERNATIONAL CLASSIFICATION					
CLAIMED					
H04W	/	36	/	00	
NON-CLAIMED					
	/		/		

US ORIGINAL CLASSIFICATION	
CLASS	**SUBCLASS**
455	436

CROSS REFERENCES(S)						
CLASS	**SUBCLASS (ONE SUBCLASS PER BLOCK)**					
455	444					

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	45	
/TU X NGUYEN/ Primary Examiner.Art Unit 2649	09 May 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20190509

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	**Art Unit**
	TU X NGUYEN	2649

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1	9	10	18	19	27	28	36	37	44	46				
/	2	10	11	19	20	28	29	37	38	45	47				
2	3	11	12	20	21	29	30	/	39						
3	4	12	13	21	22	30	31	38	40						
4	5	13	14	22	23	31	32	39	41						
5	6	14	15	23	24	32	33	40	42						
6	7	15	16	24	25	33	34	41	43						
7	8	16	17	25	26	34	35	42	44						
8	9	17	18	26	27	35	36	43	45						

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	45	
/TU X NGUYEN/ Primary Examiner.Art Unit 2649	09 May 2019	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

U.S. Patent and Trademark Office — Part of Paper No.: 20190509

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15/921,275	Ganesan et al.
	Examiner	Art Unit
	TU X NGUYEN	2649

CPC - Searched*		
Symbol	Date	Examiner
H04W36/0016	05/09/2019	TN

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
455	436,437,438,439,442,444	05/09/2019	tn

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Search EAST, history	05/09/2019	TN

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
455	444	05/09/2019	TN

/TU X NGUYEN/ Primary Examiner, Art Unit 2649	

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT
(Not for submission under 37 CFR 1.99)

Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2649
Examiner Name	Nguyen, Tu X
Attorney Docket Number	HAVA-00507

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Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
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Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
/T.X.N/	1	20020073226	A1	2002-06-13	Sridhar, Manickam R.	
/T.X.N/	2	20030061206	A1	2003-03-27	Qian, Richard	
/T.X.N/	3	20050259958	A1	2005-11-24	Johansson, Ivan	

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FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]i	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1							

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Nguyen, Tu X
	Attorney Docket Number	HAVA-00507

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NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1		

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EXAMINER SIGNATURE

Examiner Signature	/TU X NGUYEN/	Date Considered	05/09/2019

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15921275
	Filing Date	2018-03-14
	First Named Inventor	Vasudevan Ganesan
	Art Unit	2649
	Examiner Name	Nguyen, Tu X
	Attorney Docket Number	HAVA-00507

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☒ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Jonathan O. Owens/	Date (YYYY-MM-DD)	2019-03-15
Name/Print	Jonathan O. Owens	Registration Number	37902

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

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EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	("20050059400").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:49
S2	4	(("7991399") or ("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:53
S3	3	(("8467789") or ("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S4	2	(("9125128") or ("9648538")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:54
S5	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/05 19:55
S6	1453	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin switch$3 automatic$4 module$1 transceiver$1 profile memor$3 storag$3 chang$4 (hand near2 (over off)) connect$4 select$3 histo$3) with (greater higher equal$2 ping second third strong$4)	US-PGPUB; USPAT	OR	OFF	2018/01/05 20:10
S7	4707	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long near2 range)) with (wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:14
S8	4747	(licen$4 macro$5 (base near2 station) cdma tdma gsm cellular mhz celluar (long near2 range)) with (wimax wifi "wi-fi" "802.11" femto$5 pico$5 (home near2 ((base near2 station) enb router)) henb wlan unlicen$4 ghz (short near2 range)) with (time$2 period$1 duration interval$1) with (threshold$1 level$1 margin$1 strength)	US-PGPUB; USPAT	OR	OFF	2018/01/07 14:14
S9	1511	S8 and ((second multipl$4 plura$4 third)	US-	OR	OFF	2018/01/07

		near3 (threshold$1 level$1 margin$1 strength))	PGPUB; USPAT			14:32
S10	5	(("20020152305") or ("20030133421") or ("20040076144") or ("20040083360") or ("20040095916")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:46
S11	9	(("6009328") or ("6165737") or ("6195543") or ("0647413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:54
S12	11	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119") or ("7382763") or ("7398088") or ("7483984") or ("7512796") or ("8041360")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 14:57
S13	8	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:04
S14	10	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766") or ("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("2003021791")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:25
S15	10	(("20030224792") or ("20030232615") or ("2004005878") or ("20040030791") or ("20040085959") or ("20040087307") or ("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/07 15:29
S16	11	(("20040174880") or ("20040203666") or ("20040203788") or ("20040203802") or ("20040204097") or ("20040218575") or ("20040229618") or ("20050044138") or ("20050059400") or ("20050090259") or ("20050147049")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 07:22
S17	11	(("20050149740") or ("20060040711") or ("20060050663") or ("20060050687") or ("20060080423") or ("20060146767") or ("20060234678") or ("20060291455") or ("20070076665") or ("20070112948") or ("20070124490")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:35
S18	11	(("20070249390") or ("20090070489") or ("20100074228") or ("20110010282") or ("20060050721") or ("20030053632") or ("20040141484") or ("20040176128") or ("20040192294") or ("20040246990") or ("20040181811")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:42
S19	1	("20030058876").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/01/08 13:47
S20	30135	(threshold$3 with (second third fourth)) and (handoff handover (hand near2 (off over)) roam$3 switch$4) and ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") and (wwan cellular wan cdma gsm umts tdma licen$4)	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:10
S21	2400	(threshold$3 with (second third fourth))	US-	OR	OFF	2018/01/08

		and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	PGPUB; USPAT			15:14
S22	1965	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/01/08 15:30
S23	1	"20040030791"	US-PGPUB; USPAT	OR	OFF	2018/03/29 13:09
S24	4	(("9648538") or ("9125128") or ("8467789") or ("7991399")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:39
S25	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 05:58
S26	0	("sctpadjstack$1").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 09:42
S27	50	sctp adj stack$1	US-PGPUB; USPAT	OR	OFF	2018/03/30 09:42
S28	0	("2004017173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 12:21
S29	1	("20040170173").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/03/30 12:21
S30	2120	(threshold$3 with (second third fourth first) with (exceed$3 higher lower less more greater smaller larger stronger)) and ((handoff handover (hand near2 (off over)) roam$3 switch$4) with ("802.11x" "802.11" wlan unlicen$4 wifi "wi-fi") with (wwan cellular wan cdma gsm umts tdma licen$4))	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S31	13	S30 and (ganesan vasudevan).inv.	US-PGPUB; USPAT	OR	OFF	2018/03/30 12:22
S32	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/06/13 06:04
S33	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/06/13 06:38
S34	22501	(sleep$3 wak$5 passive$1activa$3 disabl$3	US-	OR	OFF	2018/09/06

		enabl$3 off shut$5 deactivat$3) with (wlan wifi "wi-fi" "802.11" (short near2 range)) with (wan wwan cell$5 macro (long near2 range))	PGPUB; USPAT			17:02
S35	12680	S34 and ((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:06
S36	2250	S35 AND ((H04W88/06 OR H04W36/14 OR H04W76/15 OR H04W8/18 OR H04W48/18 OR H04W76/25 OR H04W48/20 OR H04W52/02 OR H04W52/0245 OR H04W92/20).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:11
S37	380	S36 and timer$1 and threshold$1	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:12
S38	238	S36 and (timer$1 near3 (incre$5 activat$4 initiat$3 start$3 trigger$4))	US-PGPUB; USPAT	OR	OFF	2018/09/06 17:18
S39	5	((("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/07 09:44
S40	270610	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (threshold strength power strong$3 level$1 amplitude$1)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:49
S41	9354	S40 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53
S42	0	S41 and @ad<"01012004"	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:53
S43	4434	S41 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 09:54
S44	130788	S40 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:21
S45	5400	S44 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:23
S46	2603	S45 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:23
S47	67699	S44 and ((tim$4 duration$1 period$5 interval$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:40
S48	3459	S47 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41

		H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)				
S49	1572	S48 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 10:41
S50	241101	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S51	253563	(hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi") with (standby idl$3 sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:53
S52	24302	S51 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S53	1195	S52 AND ((H04W36/30 OR H04W36/0083 OR H04W36/08 OR H04W72/082 OR H04W36/0088 OR H04W36/0094 OR H04W52/40 OR H04W72/1231 OR H04B17/318).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:56
S54	458	S53 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 13:57
S55	447883	((hand$5 switch$3) with (network$1 (access near2 point$1) (base adj station$1) macro micro pico overlap$4 operator$1 rat$1 wan wwan cell$5 wifi (home near2 router) (short near2 range) "802.11" bluetooth "wi-fi")) and ((sleep$3 wak$5 passive$1activa$3 disabl$3 enabl$3 off shut$5 deactivat$3) with (processor$1 interfac$3 transceiver$1 wifi "802.11" bluetooth module$1 "tx/rx"))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:22
S56	141085	S55 and ((threshold strength power margin$1 strong$3 level$1 amplitude$1) near3 (first second multipl$4 plural$4 third fourth))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:24
S57	25168	S56 and ((power batter$3) near3 (sav$3 conserv$5))	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:26
S58	3184	S57 and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/09/07 14:27
S59	37162	(cellular wwan wan gsm umts cdma tdma gprs wifi "wi-fi" "802.11" wlan (local near2 wireless)) with (module$1 transceiver session control$4 process$4 circuit$3 section) with (off turnoff sleep wake$4 standby passiv$2 activat$3 deactivat$5)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:33
S60	1863	S59 and (handover handoff (hand near2 (over off))) and ((least conserv$5 sav$5	US-PGPUB;	OR	OFF	2018/09/08 15:36

		consum$5) near3 (power batter$3))	USPAT			
S61	5388	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:40
S62	5736	S59 and ((handover handoff (hand near2 (over off)) switch$3 select$5 transfer$5) near3 (network$1 operator$1 wlan wifi "802.11" cell$5 (access near2 point$1) macro pico)) and ((least conserv$5 sav$5 consum$5 extend$3 life) near3 (power batter$3))	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:41
S63	5731	S62 and (power level$1 strength amplitude margin threshold$1)	US-PGPUB; USPAT	OR	OFF	2018/09/08 15:43
S64	1	("20040030791").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S65	0	("200500594000").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/10 10:01
S66	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/09/11 09:18
S67	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 07:46
S68	1	("20050147049").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 07:48
S69	865	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 09:59
S70	5	(("20030163697") or ("20040052223") or ("20050135286") or ("20060003796") or ("20060141984")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:04
S71	5	(("20030009580") or ("20040053599") or ("20040267880") or ("20060092901") or ("20110044310")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:06
S72	8	(("6009328") or ("6175737") or ("6195543") or ("6473413") or ("6515983") or ("6553022") or ("6584087") or ("6754833")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:10
S73	6	(("6795700") or ("6862444") or ("6996107") or ("7127232") or ("7142847") or ("7254119")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:15
S74	5	(("7382763") or ("7398088") or	US-	OR	OFF	2018/10/19

		("7483984") or ("7512796") or ("8041360")).PN.	PGPUB; USPAT; USOCR			10:17
S75	9	(("8514867") or ("8520605") or ("8958434") or ("20010049790") or ("20020078174") or ("20020085516") or ("20020114305") or ("20020147008") or ("20020150228")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:20
S76	6	(("20020183038") or ("20030012350") or ("20030083079") or ("20030086366") or ("20030087629") or ("20030112766")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:30
S77	5	(("20030157899") or ("20030177196") or ("20030185172") or ("20030217007") or ("20030217091")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:31
S78	6	(("20030224792") or ("20030232615") or ("20040005878") or ("20040030791") or ("20040085959") or ("20040087307")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:33
S79	5	(("20040105424") or ("20040114559") or ("20040127208") or ("20040132427") or ("20040137902")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 10:35
S80	937	"5g" and "4g" and lte and wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:52
S81	13696	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual timer strength automacit$4))	US-PGPUB; USPAT	OR	OFF	2018/10/19 10:59
S82	11027	wimax and ((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual))	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:00
S83	63	S82 AND ((H04W36/0016).CPC.)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:01
S84	4063	((wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with wimax)	US-PGPUB; USPAT	OR	OFF	2018/10/19 11:03
S85	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/19 11:08
S86	31862	"802.11" with wifi	US-PGPUB; USPAT	OR	OFF	2018/10/22 11:20
S87	233	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with ((session near3 invitation$1) ims)	US-PGPUB; USPAT	OR	OFF	2018/10/22 12:04
S88	0	("2004017173").PN.	US-PGPUB;	OR	OFF	2018/10/22 14:24

			USPAT; USOCR			
S89	0	S88 and (stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4))	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:24
S90	1417	(stream$3 with (enhanc$3 contnuous$3 advantag$3 uninterupt$4)) and (455/$).ccls.	US-PGPUB; USPAT	OR	OFF	2018/10/22 14:25
S91	26011	((wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual))	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:43
S92	114	S91 and (boat ship) and airplane and automobile	US-PGPUB; USPAT	OR	OFF	2018/10/22 16:44
S93	17	(wan cellular gsm macro) with (femto wlan micro wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with stacks	US-PGPUB; USPAT	OR	OFF	2018/10/22 17:08
S94	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:53
S95	1	("20040203788").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 12:57
S96	1	("9648538").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:33
S97	1	("9125128").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:34
S98	1	("8467789").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
S99	1	("7991399").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 15:35
S100	1	("20060105766").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2018/10/23 16:43
S101	234	(wan cellular gsm macro) with (femto wlan wifi "802.11" bluetooth) with (handoff roam$3 handover (hand near2 (off over)) switch$3 dual) with ((session near3 invitation$1) ims)	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09
S102	1	S101 and (vasu ganesan vasudevan maes stephane).inv.	US-PGPUB; USPAT	OR	OFF	2018/10/23 17:09
S103	1	("20050239498").PN.	US-PGPUB; USPAT;	OR	OFF	2018/10/23 17:13

			USOCR			
S104	1	("20090191864").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/25 11:46
S105	0	("20090191864,20040153676").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/02/25 11:47
S106	1	("20040153676").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/09 09:14
S107	2323	(standby "stand-by" "stand by") and active and sleep and ((wifi wlan cellular gsm cdma tdma "802.11" pico macro micro operator$1 network$1) with (transceiver$1 receiver$1 transmitter$1 modem$1) with (module$3 second$3 plural$3 multipl$5))	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:21
S108	2326	(standby "stand-by" "stand by") and active and sleep and ((wifi wlan cellular gsm cdma tdma "802.11" pico wimax macro micro operator$1 network$1) with (transceiver$1 receiver$1 transmitter$1 modem$1) with (module$3 second$3 plural$3 multipl$5))	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:22
S109	2244	S108 and (timer$1 period$3 interval$1 duration)	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:23
S110	497	(standby "stand-by" "stand by") and active and sleep and ((wifi wlan cellular gsm cdma tdma "802.11" pico wimax macro micro operator$1 network$1) with (transceiver$1 receiver$1 transmitter$1 modem$1) with (module$3 second$3 plural$3 multipl$5) with (swtich$3 handoff power strength handover))	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:34
S111	507	(standby "stand-by" "stand by") and active and sleep and ((wifi wlan cellular gsm cdma tdma "802.11" pico lte "3g" "3gpp" wimax macro micro operator$1 network$1) with (transceiver$1 receiver$1 transmitter$1 modem$1) with (module$3 second$3 plural$3 multipl$5) with (swtich$3 handoff power strength handover))	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:35
S112	523	(standby "stand-by" "stand by") and active and sleep and ((wifi "wi-fi" "wi fi" wlan cellular gsm cdma tdma "802.11" pico lte "3g" "3gpp" wimax macro micro operator$1 network$1) with (transceiver$1 receiver$1 transmitter$1 modem$1) with (module$3 second$3 plural$3 multipl$5) with (swtich$3 handoff power strength handover))	US-PGPUB; USPAT	OR	OFF	2019/05/09 10:36
S113	3	(("20020073226") or ("20030061206") or ("20050259958")).PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2019/05/09 12:38

5/9/2019 12:40:40 PM
C:\Users\tnguyen51\Documents\EAST\Workspaces\15921275.wsp

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By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

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28960 7590 05/10/2019
HAVERSTOCK & OWENS LLP
162 NORTH WOLFE ROAD
SUNNYVALE, CA 94086

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(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/921,275	03/14/2018	Vasudevan Ganesan	HAVA-00507	7190

TITLE OF INVENTION: MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	SMALL	$500	$0.00	$0.00	$500	08/12/2019

EXAMINER	ART UNIT	CLASS-SUBCLASS
NGUYEN, TU X	2649	455-041200

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 Haverstock & Owens LLP
2
3

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE: Vasu Networks Corporation

(B) RESIDENCE: (CITY and STATE OR COUNTRY): San Jose, CA

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☒ Corporation or other private group entity ☐ Government

4a. Fees submitted: ☒ Issue Fee ☐ Publication Fee (if required) ☐ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

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5. **Change in Entity Status** (from status indicated above)

☐ Applicant certifying micro entity status. See 37 CFR 1.29

☐ Applicant asserting small entity status. See 37 CFR 1.27

☐ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /Jonathan O. Owens/ Date August 6, 2019

Typed or printed name Jonathan O. Owens Registration No. 37,902

Electronic Patent Application Fee Transmittal

Application Number:	15921275
Filing Date:	14-Mar-2018
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Filer:	Jonathan O Owens
Attorney Docket Number:	HAVA-00507

Filed as Small Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	2501	1	500	500

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**500**

Electronic Acknowledgement Receipt	
EFS ID:	36801410
Application Number:	15921275
International Application Number:	
Confirmation Number:	7190
Title of Invention:	MOBILE DEVICE WITH AUTOMATIC SWITCHING BETWEEN CELLULAR AND WIFI NETWORKS
First Named Inventor/Applicant Name:	Vasudevan Ganesan
Customer Number:	28960
Filer:	Jonathan O Owens
Filer Authorized By:	
Attorney Docket Number:	HAVA-00507
Receipt Date:	06-AUG-2019
Filing Date:	14-MAR-2018
Time Stamp:	18:09:21
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$500
RAM confirmation Number	E201986I09588485
Deposit Account	081275
Authorized User	Jonathan Owens
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37 CFR 1.19 (Document supply fees)

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	IssueFee_Transmital_8_6_2019.pdf	308866 43b52e62c1c92f37ec6ebde6f5f8fd78ce90dd31	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30347 ac63123feaea7402777b3ec059a1c8acd8bbfcec	no	2
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Information:					
		Total Files Size (in bytes):	339213		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc code: IDS
Doc description: Information Disclosure Statement (IDS) Filed

PTO/SB/08a (01-10)
Approved for use through 07/31/2012. OMB 0651-0031
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15921275
Filing Date	2018-03-14
First Named Inventor	Vasudevan Ganesan
Art Unit	2649
Examiner Name	Tu X. Nguyen
Attorney Docket Number	HAVA-00507

U.S.PATENTS

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ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
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APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

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