METHOD AND SYSTEM FOR REAL-TIME CHANNEL MANAGEMENT IN A RADIO TELECOMMUNICATIONS SYSTEM

FIELD OF THE INVENTION

The present invention relates to radio telecommunication systems. More specifically, the present invention relates to subscriber channel allocation and conflict resolution within radio telecommunication systems.

BACKGROUND OF THE INVENTION

In cellular telecommunication systems, a communication channel is generally assigned to a call in response to a channel usage request received by a base station, whether that request is initiated by a subscriber unit, by another base station, or within the original base station itself. Desirably, the assigned channel is selected so as not to cause interference or other conflict with other channels currently in use. This is not always possible.

When a channel usage conflict arises, each base station involved in the conflict attempts to resolve the conflict expeditiously. This creates two potential problems.

First, since a conflict by definition involves two base stations, each conflicting with the other, having both base stations attempt a resolution to the conflict creates redundant resolutions, and possibly creates other conflicts in the process. Only one of any given pair of base station need attempt a resolution. When the conflict has been resolved, it has been resolved for both base stations.

Second, having all base stations or even a "random-half" of base stations attempting conflict resolutions leads to potential excessive loading for those base stations that are already heavily loaded. Excessively loading a base station may cause that base station to fail to accept handoffs, drop calls, or perform some other unacceptable action.

What is needed is a system and method in which channel usage conflicts are avoided whenever possible. Whenever a channel usage conflict cannot be avoided, one or desirably more of the following should happen: 1) the conflict should be promptly resolved; 2) only one base station in the conflicting pair of base stations should attempt to resolve the conflict; and 3) the resolving base station in a pair of conflicting base stations should be that base station with the lesser workload.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** depicts a highly simplified diagram of a global satellite cellular telecommunication system in accordance with a preferred embodiment of the present invention;

FIG. **2** depicts a simplified diagram of a local group of satellites in a global satellite cellular telecommunication system in accordance with a preferred embodiment of the present invention;

FIG. **3** depicts a schematic representation of a pair of base stations and their respective cellular footprints in accordance with a preferred embodiment of the present invention;

FIG. **4** depicts a chart indicating a relationship between reuse units and base stations in accordance with a preferred embodiment of the present invention;

FIG. **5** depicts a flow chart of a process for managing the assignment of communication channels on a real-time basis in accordance with a preferred embodiment of the present invention;

FIG. **6** depicts a representational local-group reuse-unit allocation table in accordance with a preferred embodiment of the present invention;

FIG. **7** depicts a flow chart of a subprocess for channel usage conflict resolution in accordance with a preferred embodiment of the present invention; and

FIG. **8** depicts a flow chart of a subprocess for assigning communication channels in response to channel usage requests in accordance with a preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE DRAWINGS

FIG. **1** depicts a highly simplified diagram of a global satellite cellular telecommunication system **20** in accordance with a preferred embodiment of the present invention. System **20** represents one form of a radio telecommunications system. In a typical system **20**, base stations **22** are placed in orbit(s) **24** around earth or other celestial body. These base stations **22** then communicate with each other and with subscriber units **26**, ground stations **28**, and, through ground stations **28**, land-based telephonic equipment **30**.

In this embodiment, telecommunication base stations **22** for system **20** are realized as sixty-six satellites **22** placed in six low-earth polar orbits **24**, eleven base stations **22** per orbit **24**. Being low-earth orbits **24**, with base stations **22** having an altitude of approximately 750 kilometers and an orbital velocity of approximately 25,000 kilometers per hour, orbits **24** are by definition moving orbits, as contrasted to geosynchronous (stationary) orbits. Being polar orbits **24**, base stations **22** converge at the poles and diverge at the equator, creating a dynamic inter-satellite relationship. Those skilled in the art will appreciate that other numbers of satellites **22** in other numbers and types of orbits **24** may readily be used.

Each of base stations **22** communicates with its neighboring base stations **22**, and with each subscriber unit **26** or ground station **28**, in real time through data links **32**. Ground stations **28** interface between system **20** and the multiplicity of land-based telephonic equipment **30**. Each of base stations **22** comprises memory and a number of processors for storing and executing, respectively, the methods described herein and communication unit(s) for sending to and receiving data and/or information from adjacent base stations **22**. Base stations **22** comprise other equipment for performing those functions normally attributed to a satellite in orbit around the earth. Memory, processors and communication units are well known and commercially available from a variety of vendors.

Using a combination of base stations **22** and/or ground stations **28** as intermediaries, a subscriber unit **28** located anywhere on earth may establish a call to and communicate with another subscriber unit **28**, or with land-based telephonic equipment **30**, located anywhere on or near the surface of the earth. In system **20**, millions of such calls may be established and communicating simultaneously.

FIG. **2** depicts a simplified diagram of a local group **34** of satellites (base stations) **22** in a global satellite cellular telecommunication system **20** in accordance with a preferred embodiment of the present invention. A local group **34** is made up of a parent base station **36** and neighbor base stations **38** with which parent base station **36** has line-of-sight communications through data links **32**. Base stations **22** outside of local group **34** have no direct communication with parent base station **36**, but may communicate with parent base station **36** indirectly through other base stations **22**.

Each base station **22** in system **20** is a parent base station **36** for its own local group **34**. Therefore, each parent base