CHANNEL MANAGEMENT TECHNIQUE FOR ASYMMETRIC DATA SERVICES

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention is generally directed to a narrowband communication system, and more particularly to a channel management technique for providing asymmetric wideband data services with a narrowband communication system.

2. Background Information

The allocation of frequency spectrum, available to a given communication system, is currently controlled on a worldwide, country by country, basis. As such, the amount of frequency spectrum that is available to a given communication system (e.g., satellite and terrestrial-based cellular) can potentially limit the capacity of the system. For example, a typical satellite communication system allocates channels for voice services, low-speed data services and system overhead channels (e.g., broadcast and acquisition channels) in a primary service band. Currently, there is a demand to use such systems for other services, such as, high-speed data services. However, implementing high-speed data services can significantly impact the ability of the communication system to carry primary services, such as voice subscriber traffic, in regions with heavy peak traffic.

Interlacing wideband data services, with narrowband services, can create channel and connection management problems that are not normally experienced when only narrowband services (e.g., voice services) are provided. Additional capacity needed for wideband services is virtually non-existent in the primary service band of most conventional narrowband communication systems, due to the amount of frequency spectrum already consumed by voice services, low-speed data services and system overhead channels.

Due to the limited bandwidth of most narrowband communication systems, it is also difficult to find spectrum in which to allocate channels in a handoff cell such that true make-before-break handoffs can be accomplished, when wideband services that utilize multiple narrowband channels are provided. In particular, if there are more than a few high-speed data terminal subscribers in a local region, the task becomes increasingly difficult.

Many high-speed data terminals require a guaranteed minimum bandwidth, because of the application in which they are used. For example, U.S. government regulations require a guaranteed bandwidth for a communication system that offers aeronautical safety data services. An aeronautical safety data terminal may function as a flight recorder and provide flight data on an airplane in which it is located. This flight data may be routed through a satellite constellation, of a communication system, to an appropriate ground station. The aeronautical safety data terminal may also communicate weather related information and facilitate airplane-to-airplane communication. Unfortunately, current narrowband communication systems typically lack the ability to provide reliable guaranteed service to such high-speed data terminals.

Additionally, the communication chipset of a high-speed data terminal can become quite complex when the receiver of the terminal is required to tune across a wide range of frequencies.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will hereinafter be described in conjunction with the appended drawing figures, wherein like numerals denote like elements, and:

FIG. 1 is a simplified diagram of a satellite-based narrowband communication system, according to an embodiment of the present invention;

FIG. 2 is a diagram of an asymmetric channel assignment technique implemented with the narrowband communication system of FIG. 1;

FIGS. 3A–3C are diagrams illustrating a handoff protocol that rate negotiates a channel bandwidth of an active connection in a current cell to the number of channels that are available in a handoff cell (e.g., one channel) implemented with the narrowband communication system of FIG. 1;

FIG. 4 is flowchart of a preemption routine that utilizes special acquisition class designations in an acquisition message to provide priority access to the narrowband communication system of FIG. 1; and

FIG. 5 is a diagram illustrating how channel assignments for high-speed data terminals can be made to reduce the complexity of a high-speed data terminal communication chipset.

DETAILED DESCRIPTION OF THE PREFERRED EXEMPLARY EMBODIMENT(S)

The ensuing detailed description provides preferred exemplary embodiments only, and is not intended to limit the scope, applicability or configuration of the invention. Rather, the ensuing detailed description of the preferred exemplary embodiment(s) will provide those skilled in the art with an enabling description for implementing a preferred exemplary embodiment of the invention. It being understood that various changes may be made in the function and arrangement of elements without departing from the spirit and scope of the invention as set forth in the appended claims.

Embodiments of the present invention are directed to techniques that allow a narrowband communication system to provide asymmetric wideband data services. As used herein, a "wideband" channel generally includes a plurality of "narrowband" channels. For example, if a narrowband channel is a voice channel with a bandwidth of 4 kHz or less, then a wideband channel would have a bandwidth of at least about 8 kHz (i.e., two narrowband channels). According to one embodiment of the present invention, all downlink wideband channel assignments are made in a secondary service band. This tends to limit the impact on primary services in peak traffic regions in that the primary service band is not required to download wideband data from a communication node, e.g., a satellite, to a high-speed data terminal. As used herein, the term "high-speed data terminal" includes a data terminal that provides wideband services and the term "high-speed data" generally refers to wideband data. According to another embodiment of the present invention, a handoff protocol rate negotiates a channel bandwidth of an active connection to the amount of channels that are available in a new cell (e.g., one channel).

According to yet another embodiment of the present invention, preemption of lower priority subscribers is facilitated by special acquisition class designations (provided in an acquisition message) that allow higher priority high-speed data terminals to be identified by the communication system. In another embodiment, the complexity of a high-speed data terminal communication chipset is reduced by a receiver design that minimizes the range of frequencies that are required to be demodulated. One receiver design utilizes a single time-slot of multiple contiguous channels. Another receiver design utilizes multiple time-slots of a single channel. Yet another receiver design utilizes multiple time-slots