munication systems require substantially more downlink bandwidth than uplink bandwidth, in the primary service band. This is because high-speed data is typically uplinked in the Ka-band, whereas high-speed data is normally downlinked in the L-band, e.g., the primary service band. Most satellite communication systems use the Ka-band for communication between ground stations (e.g., gateways and system control segments) and the satellites and, as such, any data that is to be downloaded to a high-speed data terminal is routed via a gateway to one or more satellites, and therefore is uploaded in the Ka-band.

According to the present invention, a subscriber utilizing a high-speed data terminal (i.e., represented by ISU **26**) that is attempting to download data from a web server typically uplinks very minimal data, e.g., uniform resource locator (URL) type requests, on the uplink of the air interface (i.e., in the primary service band). The uplink URL request is typically routed across the constellation of satellites and down to a gateway in the Ka-band. The gateway directs the request to an appropriate web server. The web server provides the requested data which is transferred to an appropriate gateway and uplinked in the Ka-band to a satellite, or through a constellation of satellites via cross-links. The requested data is eventually downlinked in a secondary service band of the L-band frequency spectrum. In this manner, any information that a user of a high-speed data terminal downloads does not consume spectrum in the primary service band.

FIG. **2** illustrates how a secondary service band **206** is utilized in conjunction with a primary service band **226** to provide a downlink for wideband data services. As shown, channels CH**1**–CH**10** provide downlink wideband data services in time-slots three and four (TS**3** and TS**4**) of the secondary service band **206**. Data in TS**3** and TS**4** of CH**1**–CH**10** provides high-speed data to a plurality of high-speed data terminals (e.g., ISUs **26**). As shown in FIG. **2**, time-slots one and two (TS**1** and TS**2**) form an uplink **202** in the secondary service band **206** that is not utilized by the communication system **10**. Utilizing downlink **204**, in the secondary service band **206**, allows the system **10** to offload the downloading of wideband data from the primary service band **226**. Channels CH(X+1)–CH(X+10) of the primary service band **226** provide an uplink **222** in the primary service band **226**. This uplink is utilized for narrowband services and to uplink requests from high-speed data terminals. Time-slots TS**3** and TS**4** of channels CH(X+1)–CH(X+10) provide a downlink **224** for narrowband services in the primary service band **226**.

As previously discussed, the uplink **202** of the secondary service band **206** is generally not available. As shown, wideband services are provided to a total of five high-speed data subscribers in the secondary service band **206**. A first subscriber receives data on contiguous channels CH**1**–CH**4** in TS**3**. A second subscriber receives data on channels CH**5**–CH**6** in TS**3**. A third subscriber receives data on channels CH**7**–CH**10** in TS**3** and on channels CH**9**–CH**10** in TS**4**. A fourth subscriber receives data on CH**1**–CH**4** in TS**4**. A fifth subscriber receives data on CH**5**–CH**8** in TS**4**. As previously stated, offloading wideband services to the downlink **204** of the secondary service band **206** conserves frequency spectrum in the primary service band **226**. This is advantageous in that it minimizes the impact on capacity for primary services, e.g., voice services.

In summary, the primary service band **226** is used to provide an uplink and a downlink for primary services and to provide an uplink for high-speed data terminal services (e.g., URL type requests). Thus, every channel assignment in the primary service band looks like a narrowband channel, which tends to reduce channel assignment allocation conflicts. All wideband channel assignments are preferably made in the secondary service band **206**, which limits the impact on primary services in peak traffic regions in that the primary service band **226** is not required to download the data from the communication node, e.g., satellite, to a high-speed data terminal, e.g., an ISU **26**.

Pseudo Brake-before-make Handoffs

Due to the limited bandwidth of narrowband communication systems, it is difficult to find contiguous spectrum in which to allocate channels in a handoff cell (i.e., a new cell) such that true make-before-break handoffs can be accomplished. In particular, if there are more than a few high-speed data terminal subscribers in a local region, the task becomes virtually impossible. According to the present invention, a handoff protocol rate negotiates a channel bandwidth of an active connection to the number of available channels in a new cell (e.g., one channel), when the number of available channels is less than the number of channels allocated to the active connection.

For example, if a high-speed data terminal in a current cell is utilizing four channels, and only two channels are available in a handoff cell, the channels utilized in the current cell are rate negotiated to only two cells. One of ordinary skill in the art will appreciate, upon reading the disclosure herein, that it is desirable for both ends of the connection to be involved in the rate negotiation process. After the channel bandwidth is minimized in the current cell, the freed channel resources can be reallocated by the satellite. After handoff, the high-speed data terminal can then rate negotiate its channel allocation back up to, in this example, four channels.

As shown in FIGS. **3**A–**3**C, uplinks **302**, **308** and **316** of a secondary service band are not utilized, while downlinks **304**, **310** and **318** of the secondary service band are used to download high-speed data. In FIG. **3**A, before handoff, a high-speed data terminal is utilizing six contiguous channels **306** in TS**3** of a current cell. Prior to handoff, as shown in FIG. **3**B, the six contiguous channels **306** are rate negotiated to a single channel **312** in TS**3** of the current cell and a single channel **314** in TS**3** of a handoff cell. After handoff, as shown in FIG. **3**C, the high-speed data terminal has rate negotiated its assigned channels back to six contiguous channels **320** of the handoff cell. One of ordinary skill in the art will appreciate that channel assignments, other then contiguous channels, can be made. One of ordinary skill in the art will also readily appreciate that channels can be contiguous in both frequency and time.

Preferably, a single handoff request is processed to handoff all involved channels. Utilizing a single handoff request generally reduces the processing required to complete the handoff of the channels.

Technique for Preemption

A high-speed data terminal, utilized with a narrowband system, may, for example, function as a mobile office terminal, an aeronautical safety data terminal and/or a remote test station telemetry terminal. As previously mentioned, many high-speed data terminals require a guaranteed 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. On the other hand, applications, such as, remote test station telemetry, may