Synchronous TDMA DSB Network and its Applications

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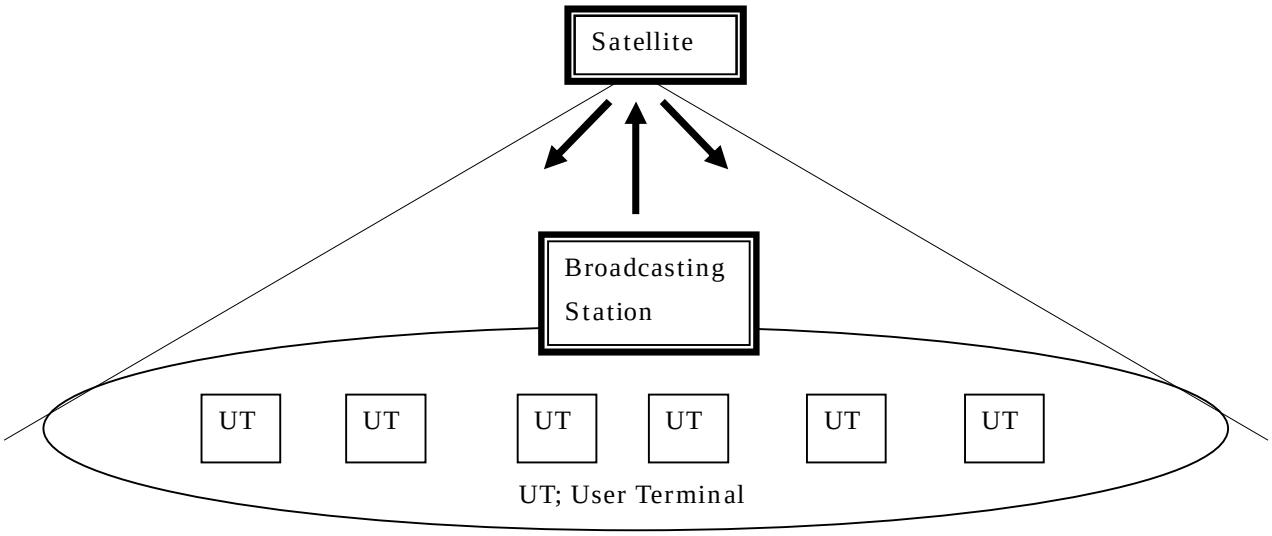
1. System configuration

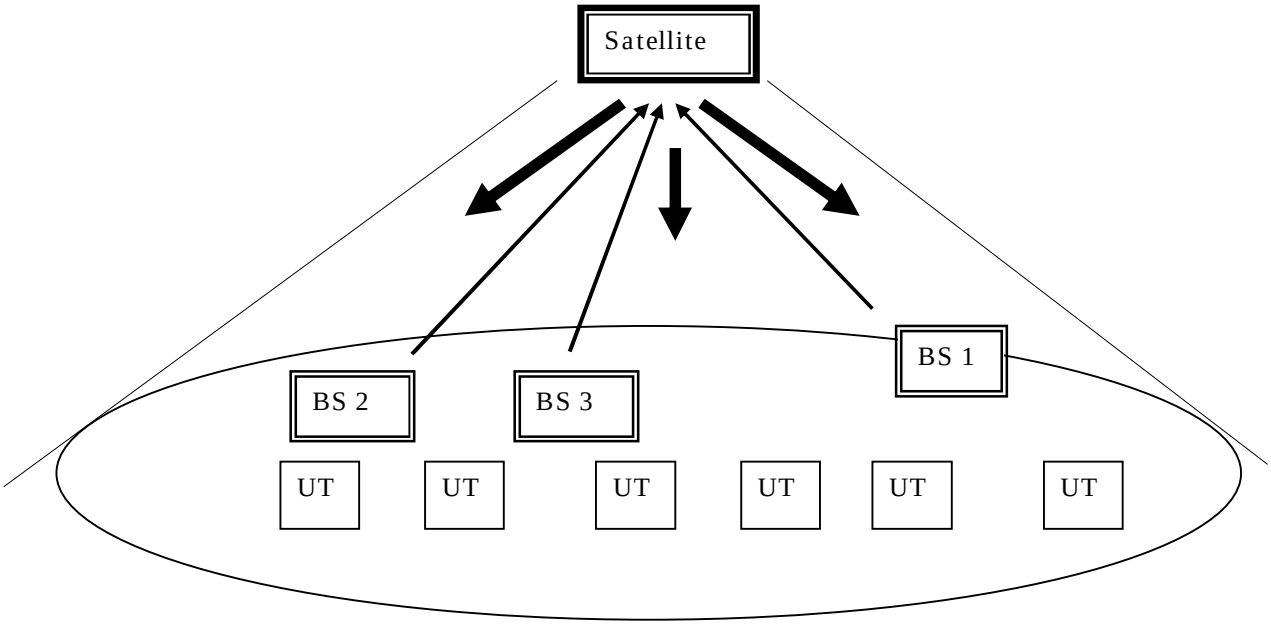
Conventional DSB System

Transmission from a single site and reception everywhere



Proposed DSB System

Transmission from multiple sites anywhere and reception everywhere



2. Features

Conventional Direct Satellite Broadcasting (DSB) system

Merits;

A single feeder link station can broadcast to all the User-Terminals (UT) in the coverage area of the satellite. A nationwide DSB system is effectively constructed with a single broadcast station.

A Star network is formed economically.

Demerits;

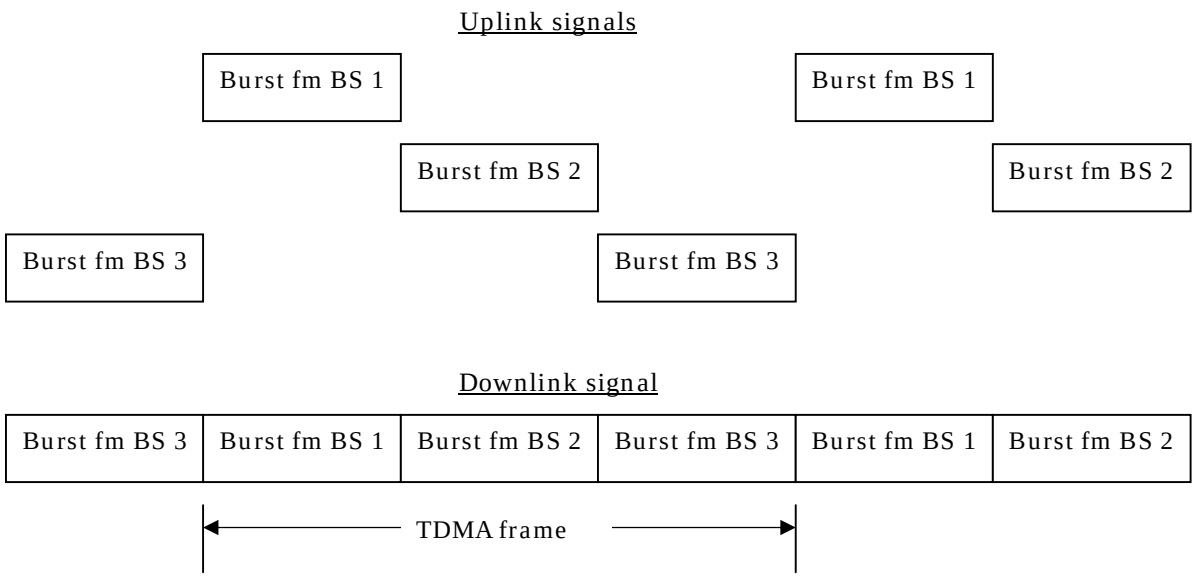
Simultaneous direct broadcasting from multiple sites is impossible. Therefore broadcasting from remote areas is difficult. Long distance communication links from the remote sites to the central broadcasting station are essential for nationwide live broadcasting, which is inconvenient and expensive. The mesh network feature of the satellites communication is not fully utilized.

Proposed Direct Satellite Broadcasting (DSB) system

The above demerits of the conventional DSB system can be easily solved with a network of small (VSAT) size broadcast stations operating in perfectly synchronous TDMA (Time division multiple access) modes. Multiple stations directly transmit their signals to a satellite sharing a common transponder and the combined signal from the satellite can be received by existing DSB receivers. In another words the system provides direct satellite access for the transmitters as well as the receivers. Live reporting from multiple sites through SNG vehicles is possible. The conventional single BS operation is also possible. The wide-area broadcasting feature of the satellite communication network is fully utilized for information exchange and dissemination from anywhere to everywhere.

3. Principle of Synchronous DSB-TDMA system

The signals from Broadcasting stations 1,2,3 in the above figure are fully synchronized on the satellite making the downlink signal from the satellite almost the same as if transmitted from the same station, hence conventional User-Terminal (UT) or DSB-IRD (Integrated-Receiver-Decoder) can receive and regenerate the signal to display it on TV sets.



The above bursts from BS 1,2,3 are fully synchronized to the phase of a clock (bit timing), thus the downlink signal becomes quite similar with a signal that would have been sent from a single station, e.g. BS 1. The synchronization is achieved through satellite loop phase-lock operations at BS 2, 3 against the signal from BS 1 functioning as a reference station.

4. Applications of Synchronous DSB-TDMA system

4.1 Nationwide Direct Satellite Broad-casting from multiple sites

Multiple broadcasting stations can share a transponder in Synchronous TDMA mode to conduct simultaneous broadcasting which can be received by conventional DSB receivers. A common satellite transponder of 27MHz can carry about 30Mbps data stream. Then about ten broadcasting stations can share the satellite transponder to send 3Mbps stream, or standard TV programs.

The effects of the proposed system on DSB are;

(1) Nationwide broadcasting from VSATs anywhere to DSB receivers everywhere is possible.
(2) A direct nationwide broadcasting from event sites by SNG (Satellite News Gathering) is possible.
(3) The diversified news media can broaden the ranges and aspects of the information exchanges.

4.2 Direct Satellite Internet

The above DSB stations can be equipped with various servers which can be accessed through the Internet. Then the Internet can be expanded to include full multicast or broadcast functions. Then new applications can be provided including;

-Nationwide Internet-broadcasting,
-Teleconferences ; nationwide and quite many participants,
-Contents Delivery Network ; a large quantity of contents to a great many users,
-Broadband access to the Internet for residents in remote islands and areas,
-Distance learning to a great many people distributed nationwide, etc.

4.3 DSB-MSAT

The proposed DSB station can be co-located with a Gateway station of MSAT, or Mobile-Satellite communication network. The co-located gateway stations can combine the features of those networks and provide a broadband Internet service to those in the vast areas of the world where no terrestrial communication means is available.

Conclusion

The proposed Synchronous TDMA DSB Network can realize useful communications which have been difficult with conventional DSB, Internet or MSAT. The proposed system is effective in combining those networks to compensate their defects and enhance their features.

The network provides a universal communication system where one can talk anywhere and listen everywhere thus turns the world into a Local Area Network.