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Concept proposal: method for receiving cell broadcast while in GPRS/EDGE data transfer mode

Overview:

The Global System for Mobile Communications (GSM) defines a teleservice that supports the concept of the transmission of a short message to all mobile stations within the coverage area of a base station, [1]. This teleservice is referred to as Short Message Service Cell Broadcast (SMSCB) service, and is identified as "Teleservice 23", [1,2].

The service permits the broadcast of unacknowledged messages to all receivers within a specific geographical region, which may comprise one or more cells, or possibly the entire Public Land Mobile Network (PLMN). Cell Broadcast messages are assigned their own geographical area of coverage by agreement between the i) information provider and ii) the PLMN operator. The Cell Broadcast messages may originate from any number of Cell Broadcast Entities (CBEs) which are connected to a single Short Message Service Center (SMSC); these are the principle network elements that are involved in implementation of this teleservice, [2].

Problem Statement:

The existing service is intended to be used to send information to users during idle mode. Nevertheless, GSM operators have expressed a desire for this service to be available during General Packet Radio Service (GPRS) or Enhanced Data for Global Evolution (EDGE) data transfer modes. Furthermore, the GSM Location Services (LCS) initiative, the standardization of which is just being completed, requires the use of SMSCB for the transmission of certain parameters to the mobile station, [6].

The problem with providing such cell broadcast services during GPRS/EDGE data transfer mode is that it is not possible to receive all of the four blocks which comprise a CBS message according to current specifications, due to inherent periodic scheduling collisions.

Summary:

Proposed is a method for receiving SMSCB messages during GPRS/EDGE data transfer mode without requiring a change to the current GSM specifications. This benefits operators and network manufacturers alike, as there is no requirement to update equipment.

Proposed Method:

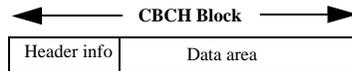
The Cell Broadcast Service (CBS) messages may comprise 82 octets each, plus a 10 octet header, which, using a default character set, equates to a maximum of 93 characters in length. Up to 15 of

these CBS messages, (referred to as "pages" in this case), may be concatenated onto one another to produce a macro-message, [2]. Each of these CBS messages comprises four 23 octet radio blocks, as specified in [3], clause 7.3 and clause 7.4. These four blocks are received in order during idle-mode, to produce a single, CBS message. Addressing and link protocol specifications for the transmission of these messages appear in [4], clause 3.2, with specifications for scheduling in [5].

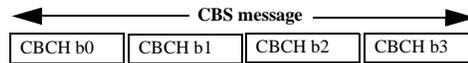
The SMSCB service is specified to be available to mobile stations only during idle mode, as per [5], clause 2, which further specifies the manner in which the base station and network cooperate in the implementation of SMSCB. It is nevertheless the case that during GPRS and EDGE data transfer mode, there are opportunities to read the Cell Broadcast Channel (CBCH), although it is not possible to read the CBCH for all 4 contiguous blocks required to construct a CBS message at one time, due to conflicts in scheduling.

It is therefore proposed that an unacknowledged, reliable SMSCB message reception protocol method be created to enable SMSCB messages to be constructed from the fragments of the multiple repetitions of the CBS messages which are repeated on the CBCH. The periodicity of these messages is controlled by the PLMN operator as per [5]. Consider the arrangement of SMSCB data from the perspective of i) data blocks, ii) messages and iii) macro-messages:

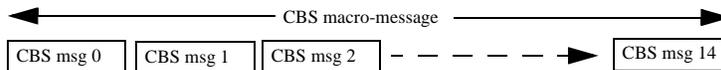
A single **CBCH data block** comprises the header, containing addressing and geographical information, along with a data area:



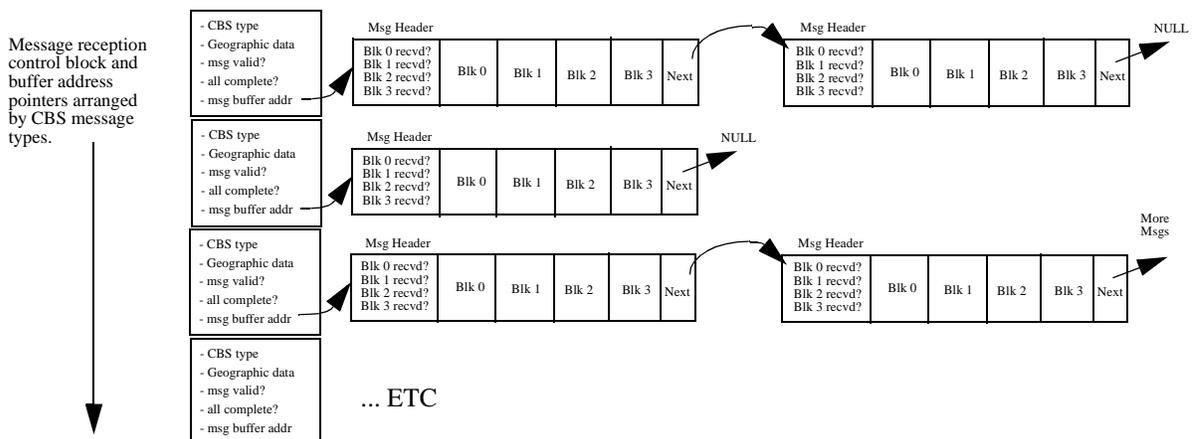
Four such blocks are combined to produce a **CBS message**:



Up to 15 CBS messages may be combined to produce a single **CBS macro-message**:



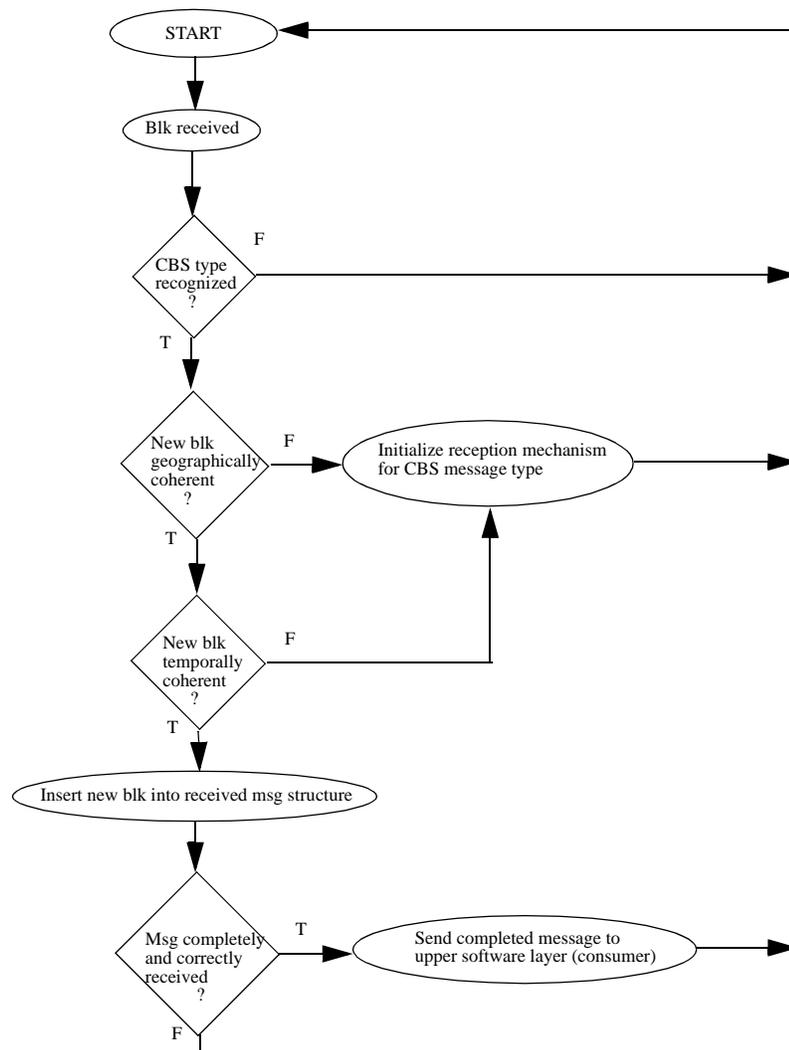
The previously described relationship gives rise to an orthogonal arrangement of lists which may be viewed as a set of addresses, each associated with a specific user-selected CBS message type:



The “message reception control block” above would contain the following components:

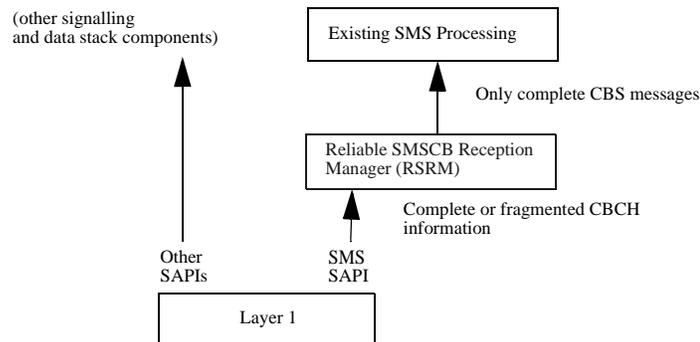
- **CBS type:** the type of broadcast message to be recognized by the mobile device.
- **Geographic data:** whether or not the mobile device has moved to a different geographical location since last receiving a message fragment.
- **Msg Valid(?):** pointer to a function that validates the message in terms of temporal coherency.
- **All complete(?):** pointer to a function that tests whether all blocks of all messages and all messages in a macromessage have been completely and correctly received.
- **Msg buffer addr:** pointer to the first buffer element.

Logic would be implemented to manage the reception of the CBCH, receiving and processing the contents of the CBCH at every available opportunity during GPRS/EDGE data transfer mode. When such logic determines that i) an entire message is received and ii) all elements in the message are valid, viz. that all blocks, messages and multiple pages are appropriate to the current geographical area, then the complete message or macro-message may be sent up to its consumer software entity. A simplified representation of the basic logical concept follows:



Note that a fair amount of logic is required to handle the geographic aspects of the information being received on CBCH. This is because certain information may become invalidated as the mobile station traverses into a different geographical region within the same PLMN, while other information may retain its validity as the mobile moves among the coverage areas of various cells.

A new software component, referred to as a "Reliable SMSCB Reception Manager", (RSRM) would be introduced into the mobile station call processing stack as per the following:



CBCH data would be directed to the new RSRM component, which would comprise either i) complete or ii) fragmented CBCH messages. The RSRM would output only complete, correctly-received CBS messages or macro-messages to the existing SMS processing component.

References:

- [1], GSM-02.03, "Digital cellular telecommunications system (Phase 2+); Teleservices supported by a GSM Public Land Mobile Network (PLMN)", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).
- [2], GSM-03.41, "Digital cellular telecommunications system (Phase 2+); Technical realization of Short Message Service Cell Broadcast (SMSCB)", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).
- [3], GSM-04.04, "Digital cellular telecommunications system (Phase 2+); Layer 1; General Requirements", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).
- [4], GSM-04.06, "Digital cellular telecommunications system (Phase 2+); Mobile Station - Base Station System (MS - BSS) interface; Data Link (DL) layer specification", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).
- [5], GSM-04.12, "Digital cellular telecommunications system (Phase 2+); Short Message Service Cell Broadcast (SMSCB) support on the mobile radio interface", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).

[6], GSM 04.35, "Digital Cellular Telecommunications System (Phase 2+); Location Services (LCS); Broadcast Network Assistance for Enhanced Observed Time Difference (E-OTD) and Global Positioning System (GPS) Positioning Methods", (European Telecommunications Standards Institute (ETSI), Global System for Mobile Communications (GSM) specifications).

[7], "Concept proposal: method for receiving cell broadcast while in GPRS/EDGE data transfer mode", (Motorola; ETSI SMG2, meeting #34, Aalborg, Denmark), 10th - 14th January 2000