May 31, 2019

Selective data access in dual-SIM dual-standby devices

Robert Greenwalt

Sooraj Sasindran

Balaji Sampath

Xiangyu Chen

Shivank Nayak

Selective data access in dual-SIM dual-standby devices

ABSTRACT

In dual-SIM dual-standby mobile devices, two protocol stacks share one radio transceiver. Thus, only one SIM can task the radio transceiver at a time, with voice calls having priority over data calls. On such devices, a default data SIM is identified and the other SIM is a voice SIM by default. When using the voice SIM to make a voice call, the radio transceiver is tasked by the voice SIM, and data services, being provided by the other SIM, are suspended. It is advantageous to continue data services in parallel to the voice call. This disclosure describes techniques that enable the user to selectively enable data on the voice SIM, such that during a voice call, selected, high-priority data connections continue uninterrupted.

KEYWORDS

- Subscriber identity module (SIM)
- Dual-SIM dual-standby (DSDS)
- Radio transceiver
- Dual SIM device
- Default data SIM (DDS)
- Mobile operating system
- Smartphone

BACKGROUND

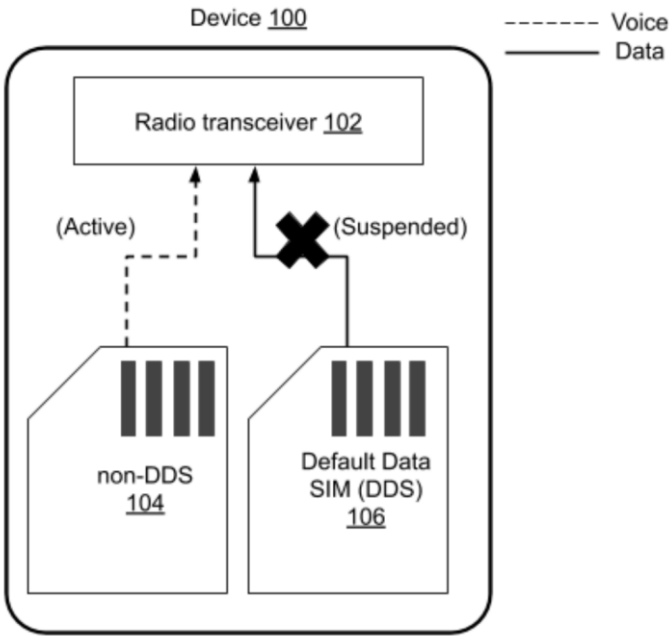

Fig. 1: A dual-SIM dual-standby mobile device. When a voice call is active on the non-DDS, data services are suspended on the DDS

Fig. 1 illustrates a dual-SIM dual-standby (DSDS) mobile device (100). In such DSDS devices, two protocol stacks share one radio transceiver (102). Thus, only one SIM can task the radio transceiver at any one time, with voice calls having priority over data calls. A default data SIM (DDS) (106) is typically identified, e.g. with user input; the other SIM is non-DDS (104) and is the default SIM for voice calls. The default data SIM typically has a low-cost data plan; the non-DDS, even though capable of accessing data services, may not have an inexpensive data plan. When using the non-DDS to make a voice (or voice over LTE, VoLTE) call, the radio transceiver is tasked by the non-DDS, and data services, being provided by the other SIM, are suspended, as shown in Fig. 1. However, there are situations in which it is advantageous to continue data services in parallel to the voice call. For example, a user on a voice call may want continued updates to their geographical position on a map application. Other examples include: a

user on a voice call wanting to continue receiving messages on messaging applications; a user on a voice call wanting to continue a WiFi hotspot, etc.

DESCRIPTION

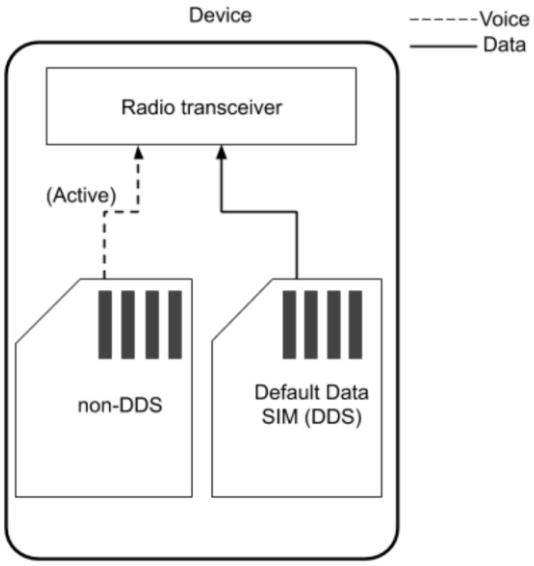

Fig. 2: Enabling data continuity during voice calls

As illustrated in Fig. 2, per techniques of this disclosure, the user can selectively enable data on the non-DDS, such that during a voice call, selected, high-priority data connections continue uninterrupted over the non-DDS. To specify certain types of data as high-priority, the user marks certain apps as being of high priority. The user is provided with the option to mark some, all, or no app as high priority. For high-priority apps, the device operating system opens a data connection on the non-DDS in addition to the regular DDS connection. Effectively, two data streams are active, although the data stream on the non-DDS may have zero throughput. When the DDS is available, the OS routes data via the DDS. If data is suspended on the DDS due to, e.g., a voice call on the non-DDS, the OS continues data transfer for high-priority apps via the

non-DDS. Keeping an open data connection on the non-DDS, even when it has no active data, can reduce the switchover delay.

In this manner, data that is assigned a high-priority label can travel via either of the two SIMs, while data of all priority classes travel via the default data SIM. In this respect, data that is assigned a high-priority label by the user is similar to voice, which also can travel via either of the two SIMs. The techniques leverage the ability of cellular networks and mobile devices to simultaneously support voice and data over a single SIM. Since data connectivity via both SIMs is controlled by the user, data continuity is ensured in a cost-optimal manner.

Alternate to marking certain apps as high-priority, data can be enabled for all applications via the non-DDS, with the aggregate data rate being throttled, e.g., subjected to speed and/or volume constraints that keep data costs below a user-specified threshold. Additionally, data downloads or uploads by background processes or applications can be denied.

Alternatively, the user or device can change default settings for data and voice SIMs during a voice call. For example, upon initiating a voice call on the non-DDS, that SIM is re-labeled as a DDS, thereby enabling data to be routed through that SIM alongside voice. Aside from the inconvenience and higher cost of routing data via a SIM that was originally non-DDS, applications can also suffer loss in IP connectivity during the non-DDS to DDS relabeling.

Still alternatively, simultaneous voice and data can be supported by providing two radio transceivers on the mobile device at an additional hardware cost. However, this alternative may not work for all band combinations.

The techniques of this disclosure are also useful when the default data SIM is out of coverage, e.g., due to a radio fade, due to network connectivity problems, etc. In such a case, high-priority data or throttled data of all priorities can still travel via the non-DDS.

CONCLUSION

This disclosure describes techniques that enable the user to selectively enable data on a SIM that is not by default a data SIM, such that during a voice call, selected, high-priority data connections continue uninterrupted.