

“White Screen of Death” Recovery Techniques for Smartphones

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The Application Problem

An emerging trend in the mobile handset 3G space is the adoption of custom software applications, a.k.a. “apps”. However, an app is often developed and tested thoroughly on one application platform, but the very same app may not perform as well on other hardware/chipset platforms or in conjunction with other service providers. This situation can result in the mobile user experiencing the “White Screen of Death” (WSOD).

When an app functions on a platform environment for the first time, it is possible that it can freeze the handset operation. Consumers using PCs have coined the phrase “Blue Screen of Death” to describe entering states of uncontrolled or frozen operation when the screen turns completely blue. The same thing happens on mobile handsets when running applications and the screen turns white. The “White Screen of Death” is more prevalent than ever and has been reported as a major reason for users returning their mobile devices to service providers.

When a mobile phone manufacturer uses only one service provider, one handset manufacturer and one chipset provider to market the application concurrently, the testing is likely to be very comprehensive and the user will have smooth operation.

Because most apps are developed after the hardware platform is available, the application requirements are not necessarily included as part of the chipset/handset development testing process. Market pressures are enormous, and the absence of formally recognized application testing standards can result in a hurried approval. Thus, it is possible for a user to be the first person to use an app under a unique set of hardware (handset and chip set), software and network circumstances.

Consumers in the PC world have learned that recovery from the “Blue Screen of Death” has been a complete system restart. Because the PC is locked up, battery removal is usually necessary to escape the frozen mode and initiate a power-up from ground zero. Because many mobile device batteries cannot be removed, the user is unable to reset the device as a result of an application induced fault. The only choice the user has is to let the battery drain to a dead state, which can take days or even weeks. Alternatively, the user can return the locked device to the service provider and request a replacement.

WSOD Recovery Techniques

Techniques that can be used to recover from the WSOD are presented here.

Separate High-Power Reset Switch

The first technique is the installation of a separate high power RESET switch - which is normally closed - into the mobile device to directly disconnect the battery from all circuits upon user activation. While this can be an effective solution, the downside includes dropped resistance from the additional switch, the cost of the high current wiring involved, and safety issues from having the potential for high current at additional locations within the device.

Software Reset

The second technique to recover from the “White Screen of Death” is to reset the software to the baseband processor, which can be an effective way to restart it. However, if the baseband system processor stops operating from a rogue application in a way that is not recognized by additional devices within the mobile device (such as an applications processor), the resumption of normal operations of the baseband processor is possible by allowing the application



processor to remain in an unrecognized state. In this case, system operation may resume but will be unpredictable and secondary system crashes will occur.

Power Management ICs

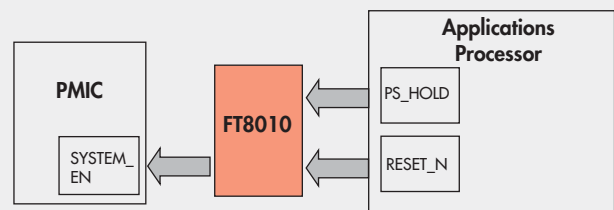
The Power Management IC (PMIC) is a good choice to initiate a system reset. PMICs include digital control algorithms and a power-up sequence to efficiently control power to the numerous loads within the handset. Thus, PMICs have become integrated into mobile device systems operation with feedback through busses and interrupts. Because PMICs have become complex and are dependent upon interaction with the baseband applications processors, it is possible that a corrupt state in the baseband processor can lock-up a PMIC so the user loses control.

Reset IC

A technique to recover from the “White Screen of Death” borrowed from high-reliability market systems, such as medical and aircraft is autonomous system control—where a semiconductor device (reset chip) is used to reset PMIC’s and power devices independent of the devices they control. There is normally no feedback mechanism so the corrupt states from microcontroller chips cannot affect it. The reset chip can be user-activated in a very simple manner that mimics the removal of the mobile device battery. In this case, power is removed from system control chips such as baseband and applications processors, PMICs, and other control chips allowing a subsequent normal power-up in a predictable manner. It is important that this type of system reset is designed to avoid inadvertent activation. Typical activation of this function are hidden keys, a designated extended time press key, or depression of certain designated keys simultaneously.

The matrix of chipset vendors, mobile device vendors and service providers is enormous, and there will always be the case of a platform where an app has not been tested. The development of a risk free “reset” mechanism is required in mobile devices in order to achieve a reasonable amount of user satisfaction. Without a reliable reset mechanism, the industry can expect increased user frustration and a financial impact due to an increased number of returned handsets.

Solution Update



Typical Application

Responding to a direct request from a leading handset provider, Fairchild has just released the FT8010—a custom reset timer with a configurable time select pin to allow for resetting a device at the touch of a designated keypad function. This single chip solution is ideal for solving the WSOD problem in minimum space, while consuming minimum I_{CC} current when inactive. Product information is now available at www.fairchildsemi.com/pf/FT/FT8010.html.