INTRODUCTION
Recently, the U.S. Coast Guard (USCG) and partner agencies are looking to modernize Differential Global Position System (DGPS). The modernization potentials include not only GPS receiver technology, but also networking technologies, new GPS signals, possible data compression techniques and correction information generation techniques, all of which are aimed at providing the end-user with improved capabilities (accuracy, integrity, continuity, and availability). The USCG has identified a need to re-capitalized the Reference Station (RS) and Integrity Monitor (IM) equipment used in the DGPS. As a result, the scheme in preparing for the future DGPS is to port current RTCM SC-104 compatible RS and IM functionality onto an open architecture PC-based platform. However, their scheme lacks the open architecture required to include future system improvements such as use of new civil frequencies on L2 and L5 and realization of a higher rate NDGPS beacon data channel intended to support RTK and upcoming Galileo if possible and function of integrity monitor for abnormal GNSS signals. To solve this apprehension, this paper proposes a hybrid SDR (software defined radio)-based software architecture for DGPS Reference Station (RS) and Integrity Monitor (IM) modernization.

EXISTING RSIM FOR MARITIME DGPS
The typical DGPS radiobeacon consists of control station (CS) and hardware dedicated off-the-shelf reference station (RS) and integrity monitor (IM), where redundancy can be applied to RS, IM, and CS equipment. Recently, the USCG and partner agencies are looking to modernize DGPS. Software RSIM is to implement the RS, IM, and CS by software, using off-the-shelf hardware GNSS receivers. This has the advantage of flexibility as the hardware would be easy to replace and reconfigure. But software RSIM also has the weakness on flexibility for future GNSS signals compared with software radio integrated software RSIM by which software radio technology is used instead of hardware GNSS receiver and beacon receiver.

PROPOSED RSIM ARCHITECTURE
The proposed hybrid SDR-based software RSIM consists of GNSS RF module and RSIM processing module embedded in personal computer, where GNSS RF module receives the GNSS RF signals, converts the analog data of RF frequency into the digitized data of IF frequency, and then transfers the digitized data to RSIM processing module using high speed interface. And RSIM processing module consists of PCI card type correlator, SDR & RSIM software, and MSK modulator/de-modulator.

PERFORMANCE EVALUATION
This paper evaluates the correction quality of the proposed hybrid SDR-based software RSIM to verify whether to satisfy the correction accuracy presented in RTCM standards 10401.2 (2006). This paper shows that the PRC and RRC quality of the proposed hybrid SDR-based software RSIM satisfies the accuracy presented in RTCM standards 10401.2 respectively. And this paper proposes fault detection and isolation algorithms for maritime DGPS to enhance integrity monitoring performance of DGPS service.

CONCLUSION
This paper described that available hardware dedicated off-the-shelf maritime DGPS RSIM lacks the open architecture to meet all the minimum maritime user requirements and to include future GNSS improvements. And this paper proposed more effective and flexible RSIM architecture for maritime DGPS. Additional and available test are added to the proposed hybrid SDR-based RSIM besides integrity monitoring algorithms in the existing hardware dedicated off-the-shelf RSIM. Out of this the proposed RSIM can detect a sudden increase of the ionosphere and multipath errors.

REFERENCES