Study on Processer-in-the-loop Simulations for Spacecraft Software Verification

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We have been developing a spacecraft simulation environment. The simulation environment can be applied not only to a full-software simulation (FSS), but also to a hardware-in-the-loop simulation (HILS) and to a processor-in-the-loop simulation (PILS); where HILS include a operations console or space-qualified on-board hardware, and PILS include on-board software (OBS) embedded in spacecraft systems, as distributed elements. PILS is one of the important steps for verification of OBS to prevent some accidents caused by the software during spacecraft operations. We proposed a configuration of PILS assuming a distributed simulation consist of the simulation environment worked on a usual PC and OBS on a real-time operating system installed in an on-board computer, interacting by a distributed computing middleware HORB. In order to demonstrate the feasibility of the configuration, an experimental system was implemented with simplified simulation models and OBS.

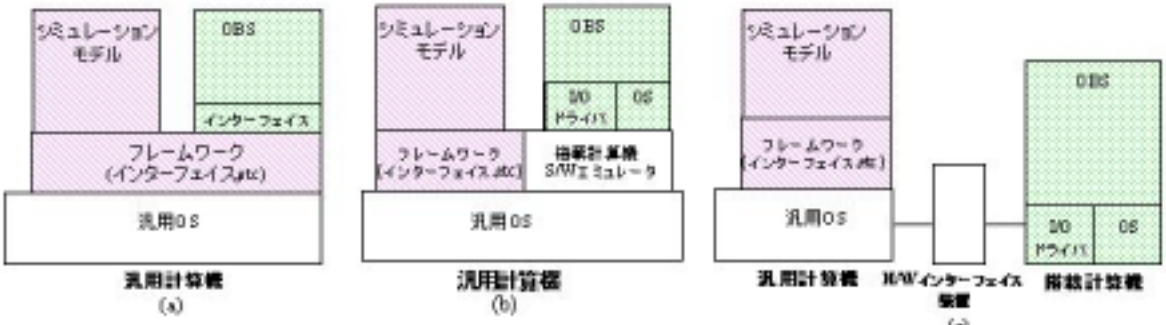

図1. 従来の搭載ソフトウェア検証環境

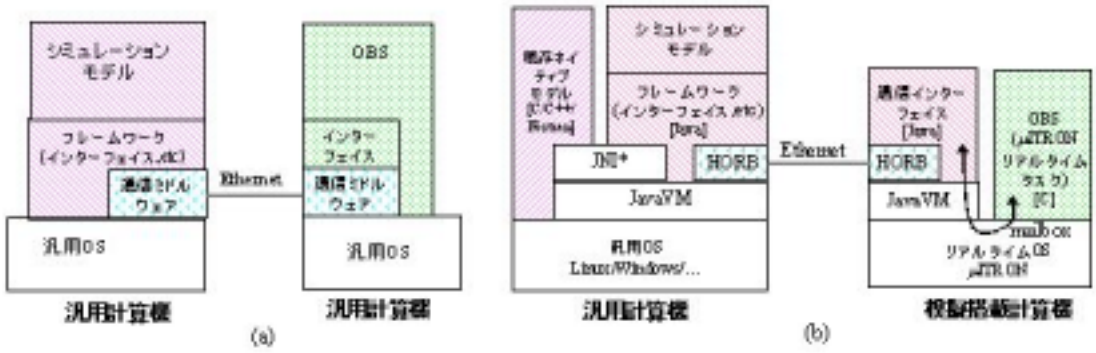

図2. 新たな搭載ソフトウェア検証環境