ABSTRACT

The memory allocation algorithms have been analyzed and worked upon broadly, but there is less attention given to the multiprocessor architecture and real-time operating system as well. Most of the algorithms are applicable for the general-purpose operating system and do not fulfill the necessities of real-time systems. Moreover, limited allocators designed to support real-time systems which are not completely scalable for multiprocessors. In the 21st century, as we have entered into an era of high-performance computing, the demand for multi-core architecture has gained momentum. NUMA architecture based systems are the outcome of this tendency and offer an organized scalable design. However, existing dynamic memory allocators are not capable of performing on a multiprocessor architecture and do not comply with real-time system requirements as well. Researches have proved that the existing memory allocators for any operating systems which support NUMA architecture are not suitable for real-time applications. Hence, there is a need to have a dynamic memory allocator which can perform well on SMP and NUMA based soft real-time systems, with better execution time and less fragmentation.

This research is carried out in the same direction to achieve the aforementioned goal of a dynamic memory allocator for real-time systems. 1). Dynamic memory allocator **DmRT** has been designed and implemented for symmetric multiprocessing system which provide consistent and optimum execution time, less memory fragmentation as well as satisfying maximum number of memory request with compare to other existing allocator. 2). As per the need of high performance computing, a dynamic memory allocator **DmRT** for NUMA architecture based real-time operating system has been designed and implemented which also provide consistent and optimum execution time, less memory fragmentation as well as satisfying maximum number of memory request. 3). There are so many simulators available to simulate different test cases for scheduling in a real-time operating system like Litmus-RT, Mark3, rtsim, etc., but till date, none of the simulators is available for simulating memory management algorithm for RTOS. Hence, **MemSimRT** has been designed to simulate various memory allocators for both SMP as well as NUMA architecture based RTOS.