

# A Study on User-level Remote Memory Extension System

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**Abstract**— The speed of memory capacity expansion of the computer system has not kept up with the speed of the increase of the memory requirement of large memory applications. Also, big memory system has been too expensive for many researchers and students. Therefore, approaches to utilize remote memory has been considered as a cost effective way to run large memory applications in the cluster environment where computing nodes are connected via high speed network. For the general users of HPC cluster system who want to run large memory application without administrator's support, we suggest a user-level remote memory extension method. We designed and implemented a remote memory extension system which mapped remote memory pages to the virtual address space of the large memory application process. The system includes three components such as remote memory consumer, integrated memory manager, and memory provider. We also developed a test program and did experiment to show how good performance the user-level remote memory extension system can achieves. Through the experimental test, we will show the measured latency and bandwidth of user-level remote memory extension system for sequential access pattern and random access pattern.

**Keyword**— Remote memory, Large memory application, Memory extension, Remote memory library, Page fault handling, Remote memory consumer Integrated memory manager, Memory provider



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