1 Introduction

Advances in cloud computing technologies have allowed consumers and businesses to run their applications on demand to enormous scale. They can rent hundreds or thousands of computers with supported infrastructure to process data and compute results. The rental cost of a hundred machines with over a terabyte of aggregated memory is now below $100 per hour, making it feasible for users to process terabyte of data in main memory in the cloud. IDC predicted that by 2102, customer spending on cloud services will grow almost to $42 billion. Besides providing good performance and low cost services, the cloud computing infrastructure needs to guarantee fault-tolerant.

As the cluster scales, the fault-tolerant requirement becomes harder and harder to fulfill. Estimates based on recent cluster growth rates predict that the mean-time-to-failure of large-scale applications will become significantly shorter than its execution. So, using the conventional checkpoint-recovery techniques, the applications will spend all its time writing checkpoints or recovering. That leads to zero-utilization. Hence, there is a dire-need to provide a feasible fault-tolerant mechanism for cloud computing services.

With funding, our plan firstly is to develop efficient checkpoint-recovery techniques that users can easily use to make their large-scale applications fault-tolerant.

For the past one year, we have focus on a specified domain in cloud applications, i.e. Massively Multiplayer Online Games and large-scale simulations. We thoroughly researched and evaluated the applicability of existing checkpoint recovery techniques which were developed for MMOs. There are no appropriate solutions which can be applied to various types of workload in these applications. As such, we are designing new state fault-tolerance techniques that are more adequate to the particularities of these applications. Interactive applications, such as MMOs, have latency as a major concern; on the other hand, non-interactive applications, such as scientific simulations, must be run on large clusters with low overhead. The experimental evaluations of our ongoing work showed that our new algorithms achieved nearly constant latency and more than one order-of-magnitude lower overhead than the best previous methods.

The next step in our plan is to package our technologies as a library to sell to cloud computing providers as well as users which would like to make their large-scale applications fault-tolerant.