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CYPRESS: COMBINING STATIC AND DYNAMIC ANALYSIS FOR TOP-DOWN COMMUNICATION TRACE COMPRESSION

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ABSTRACT: Communication traces are increasingly important, both for parallel applications' performance analysis/optimization, and for designing next-generation HPC systems. Meanwhile, the problem size and the execution scale on supercomputers keep growing, producing prohibitive volume of communication traces. To reduce the size of communication traces, existing dynamic compression methods introduce large compression overhead with the job scale.

We propose a hybrid static-dynamic method that leverages information acquired from static analysis to facilitate more effective and efficient dynamic trace compression. Our proposed scheme, CYPRESS, extracts a program communication structure tree at compile time using inter-procedural analysis. This tree naturally contains crucial iterative computing features such as the loop structure, allowing subsequent runtime compression to "fill in", in a "top-down" manner, event details into the known communication template. Results show that CYPRESS reduces intra-process and inter-process compression overhead up to 5X and 9X respectively over state-of-the-art dynamic methods, while only introducing very low compiling overhead.

BIOGRAPHY: Jidong Zhai is an assistant professor in the CS Department of Tsinghua University. He received the Ph.D. degree in computer science from Tsinghua University in 2010, with the Excellent Ph.D. Graduate Student Award of Tsinghua University. His research is focusing on high performance computing, compiler optimization, performance analysis and optimization of large-scale parallel applications. His paper in SC'14 was selected as the Best Paper Finalist. He is a recipient of Siebel Scholar and CCF outstanding doctoral dissertation award.