

Bristlecone: A Language for Robust Software Systems

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Abstract

We present Bristlecone, a programming language for robust software systems. The Bristlecone language contains two components: a high-level organization specification component that describes how the software system's conceptual operations interact, and a low-level operational specification component that describes the sequence of instructions that comprise an individual conceptual operation. The Bristlecone implementation uses the high-level organization specifications to detect software errors, to recover the software system from an error to a consistent state, and to reason how to safely continue the software system's execution after the error.

We have implemented a compiler and runtime for the Bristlecone language. We have evaluated this implementation on three benchmark applications: a web crawler, a web server, and a multi-room chat server. We developed both a Bristlecone version and a multi-threaded Java version of each of the benchmark applications. We designed the Java versions of the benchmark applications to use threads to tolerate many software faults. We injected failures into each version of the benchmark applications and then observed the effects of the injected failures. We found that the Bristlecone versions of the benchmark applications were able to more successfully survive the injected failures.