

REALMS: Lock-free Object Access in Multi-threaded Execution Environments

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Writing multi-threaded software is crucial when achieving the best performance using modern hardware. One central problem is that thread safety in a multi-threaded environment is not always easy to debug. Complex tooling or hardware support might usually be needed to debug threaded applications. This presentation proposes the concept of realms that provide a dynamic thread-safety system to detect erroneous modification of shared objects at the runtime of a multi-threaded program. The thread-safety system allows the sharing of objects between multiple threads in a lock-free manner. It can be used as debug tooling but also as a safety mechanism. Realms lead to a rethinking of the design of a multi-threaded program because realms correlate with the program's control flow. A realm can be understood as a collection of objects associated with a thread. By restricting the thread execution to a hierarchical structure, lock-free object access gets possible.