Accountable Distributed Computing

Petr Kuznetsov
LTCI, Télécom Paris, Institut Polytechnique de Paris, France

Abstract

There are two major ways to deal with failures in distributed computing: fault-tolerance and accountability. Fault-tolerance intends to anticipate failures by investing into replication and synchronization, so that the system’s correctness is not affected by faulty components. In contrast, accountability enables detecting failures a posteriori and raising undeniable evidences against faulty components.

In this talk, we discuss how accountability can be achieved, both in generic and application-specific ways. We begin with an overview of fault detection mechanisms used in benign, crash-prone system, with a focus on the weakest failure detector question. We then consider the fault detection problem in systems with general, Byzantine failures and explore which classes of misbehavior can be detected and which – cannot. We then study the mechanism of application-specific accountability that, intuitively, only accounts for instances of misbehavior that affect particular correctness criteria. Finally, we discuss how fault detection can be combined with reconfiguration, opening an avenue of “self-healing” systems that seamlessly replace faulty system components with correct ones.

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