

## Safety and Liveness

Informally, a safety property asserts that something bad does not happen. More precisely, a safety property is one that can be violated by a single step of a behavior, or by its first state. For example, the property

whenever  $x$  equals  $y$ , they both equal the gcd of  $M$  and  $N$ .

is a safety property because it can be violated by a step that makes  $x$  and  $y$  equal without making them equal to the gcd of  $M$  and  $N$ .

Informally, a liveness property asserts that something good eventually happens. More precisely, a liveness property is one that you cannot tell is violated without seeing the entire behavior. For example, the property that eventually  $x$  equals  $y$  is a liveness property because you need to see the entire behavior to know that  $x$  is never equal to  $y$ .

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