Specification Safety vs. Liveness

- Safety: "something bad does not happen"
  - State invariant, e.g. $G(\neg bad)$

- Liveness: "something good eventually happens"
  - Eventuality, e.g. $GF(good)$

- Fairness conditions
  - Fair traces satisfy each of the fairness conditions infinitely often
  - E.g. only fair if it doesn't delay acknowledging a request forever

- Every property can be written as a conjunction of a safety and liveness property

Bowen Alpern and Fred B. Schneider. Defining liveness. Information Processing Letters, 21(4):181–185, October 1985.