

What is Strong Fairness?

Naming a property *weak fairness* suggests that there is also a property named *strong fairness*. Strong fairness of an action A , written $\text{SF}_{vars}(A)$, is the condition obtained by replacing 3b with:

3b'. If the behavior is infinite, then there is no n such that the infinite behavior $s_n \rightarrow s_{n+1} \rightarrow \dots$ has no A steps but A is enabled in infinitely many of its states.

This is stronger than 3b because the condition *A enabled in infinitely many states* in 3b' that must not hold is weaker than the corresponding condition *A enabled in all states* that must not hold in 3b.

Weak fairness is a more common requirement than strong fairness—though for many specifications, the two conditions are equivalent. For example, weak and strong fairness are equivalent for the actions *Producer* and *Consumer* of algorithm *Alternation*. This is because conditions 1 and 2 imply that an infinite behavior must have infinitely many *Producer* and *Consumer* actions.