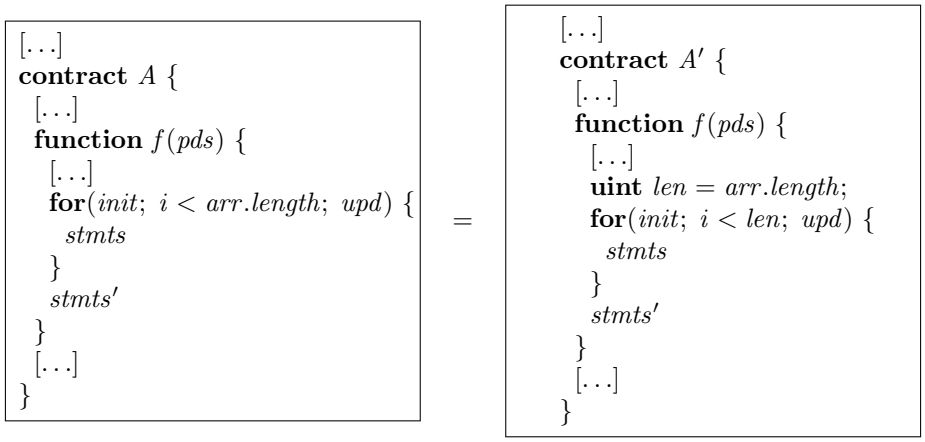
Rule 0.25 ⟨*Cache Array Length in Loops*⟩



where

arr is an array whose length is accessed in the loop condition;

arr.length is the array length property accessed in each loop iteration;

len is a local variable that caches the array length;

init and *upd* are the loop initialization and update expressions;

i is the loop index variable;

stmts represents the loop body statements;

pds are the parameter declarations of function f;

stmts′ represents statements following the loop.

provided

The array length is accessed in the loop condition on every iteration;

The array *arr* is not modified within the loop in a way that changes its length;

No operations within the loop (e.g., **push**, **pop**) alter the array size;

Caching the length does not affect the correctness of the loop;

The cached length remains valid throughout loop execution.

Invariant:

Let s_i and s_i' be the initial state of A and A', respectively.

Let s_f and s_f' be the state reached by A and A', respectively, after $A.f()$ and $A'.f()$ are executed from s_i and s_i', respectively.

Then, the coupling invariant is

$$\forall\, s_i, s_i' \;.\; (s_i = s_i') \rightarrow (s_f = s_f')$$