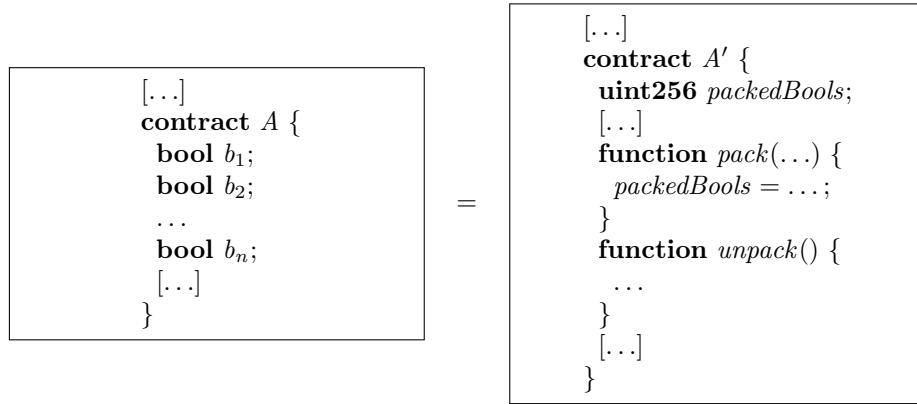

Rule 0.7 *(Boolean Packing)*

**where**

b_i are boolean state variables for $i = 1, \dots, n$ where $n \leq 32$;

packedBools is a `uint256` variable that stores up to 32 boolean values;

$mask_i = 1 \ll (i - 1)$ is the bit mask for the i -th boolean;

pack is a function that sets boolean values in *packedBools* using bitwise operations;

unpack is a function that retrieves boolean values from *packedBools* using bitwise operations.

provided

The number of boolean variables $n \leq 32$;

All accesses to b_i in *A* are replaced with appropriate calls to *pack* and *unpack* in *A'*;

The packing operation uses: $packedBools = (packedBools \& \sim mask_i) \mid (b_i ? mask_i : 0)$;

The unpacking operation uses: $b_i = (packedBools \& mask_i) \neq 0$;

No concurrent modifications occur that would violate atomicity of pack/unpack operations.

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

$$\forall s_i, s'_i . (s_i = s'_i) \rightarrow (s_f = s'_f)$$