
Rule 0.16 *⟨Use Short-Circuiting for Conditional Expressions⟩*

<pre> [...] contract A { [...] function f(pds) { [...] temp = expr₂; if (expr₁ op temp) { stmts } stmts' } [...] } </pre>	=	<pre> [...] contract A' { [...] function f(pds) { [...] if (expr₁ op expr₂) { stmts } stmts' } [...] } </pre>
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where

- expr*₁ is a less expensive boolean expression (cheap check);
- expr*₂ is a more expensive boolean expression (expensive check);
- op* is a short-circuiting logical operator ($\wedge\wedge$ for AND or $\vee\vee$ for OR);
- temp* is a temporary variable storing the result of *expr*₂;
- pds* are the parameter declarations of function *f*;
- stmts* and *stmts'* represent statement sequences.

provided

- For *op* = $\wedge\wedge$: *expr*₁ should be the cheaper condition that fails early;
- For *op* = $\vee\vee$: *expr*₁ should be the cheaper condition that succeeds early;
- The expression *expr*₂ is only evaluated when necessary due to short-circuit evaluation;
- The expressions *expr*₁ and *expr*₂ have no side effects that affect each other;
- The order of evaluation does not affect the correctness of the program;
- expr*₂ is more expensive (in gas) than *expr*₁.

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

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