
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

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