

310 What is wrong with defining local variable declaration as follows:

$$\mathbf{new} \ x: T \cdot P \quad = \quad \forall x: T \cdot \exists x': T \cdot P$$

After trying the question, scroll down to the solution.

§ Programs are implementable. Consider the program

new $x: \text{int}$ $y := x$

with global integer variables y and z . Using the suggested definition,

new $x: \text{int}$ $y := x$

$= \forall x. \exists x'. x' = x \wedge y' = x \wedge z' = z$

$= \perp$

we get something unimplementable. If we had used the proper definition

new $x: \text{int}$ $y := x$

$= \exists x, x'. x' = x \wedge y' = x \wedge z' = z$

$= z' = z$

we get something implementable, as we should. Less importantly, with the new definition, a *null* type is implementable:

new $x: \text{null}$ $x := 0$

$= \forall x: \text{null}. \exists x': \text{null}. x' = 0 \wedge y' = y \wedge z' = z$

$= \top$

If we had used the proper definition

new $x: \text{null}$ $x := 0$

$= \exists x: \text{null}. \exists x': \text{null}. x' = 0 \wedge y' = y \wedge z' = z$

$= \perp$

the *null* type is unimplementable, as it should be. Note that the assignment is out-of-range.