

# Nix simplified semantics

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Reduction rules

$$\begin{aligned}
 \{ x = e; \dots \}.x &\rightarrow e \\
 \{ x = e; \dots \}.x \text{ or } e &\rightarrow e \\
 e.a \text{ or } e' &\rightarrow e' \text{ if } e \not\rightarrow^* \{ x = e; \dots \} \\
 (x:e1) e2 &\rightarrow e1 [e2/x] \\
 (p:e1) v &\rightarrow e1 [v/p] \\
 \text{with } \{ x_1 = e_1; \dots; x_n = e_n; e \} &\rightarrow e[e_1/x_1; \dots; e_n/x_n] \\
 \text{raise } e &\rightarrow \perp \\
 \text{if true then } e_1 \text{ else } e_2 &\rightarrow e_1 \\
 \text{if false then } e_1 \text{ else } e_2 &\rightarrow e_2 \\
 \text{let } x_1 = e_1; \dots; x_n = e_n; \text{ in } e &\rightarrow e [ \\
 &e_1[\text{let } x_1 = e_1; \dots; x_n = e_n; \text{ in } x_1/x_1]; \\
 &\dots; \\
 &e_n[\text{let } x_1 = e_1; \dots; x_n = e_n; \text{ in } x_n/x_n] \\
 &]
 \end{aligned}$$

Where

$$\begin{aligned}
 e/q @ x &\stackrel{\text{def}}{=} e/x; e/q \\
 \{ x = e; g_1; \dots; g_n \} / \{ x, f_1, \dots, f_n \} &\stackrel{\text{def}}{=} e/x; g_1; \dots; g_n / f_1, \dots, f_n \\
 \{ x = e; g_1; \dots; g_n \} / \{ x?e', f_1, \dots, f_n \} &\stackrel{\text{def}}{=} e/x; \{ g_1; \dots; g_n \} / \{ f_1, \dots, f_n \} \\
 \{ g_1; \dots; g_n \} / \{ x?e', f_1, \dots, f_n \} &\stackrel{\text{def}}{=} e'/x; \{ g_1; \dots; g_n \} / \{ f_1, \dots, f_n \} \text{ if } \{ g_{\_1}; \dots; g_{\_n} \} \not\rightarrow^* \{ x = e; \dots \} \\
 \{ g_1; \dots; g_n \} / \{ \dots \} &\stackrel{\text{def}}{=} \emptyset \\
 \text{Cons}(e, e') / \text{Cons}(x, x') &\stackrel{\text{def}}{=} e/x; e'/x'
 \end{aligned}$$

Reduction contexts

$$\begin{aligned}
 E ::= & \square \mid E e \\
 & \mid E.w \mid E.w \text{ or } e \mid v.F \mid v.F \text{ or } e \\
 & \mid \{ x = e; \dots; x = e; E = e; \dots; e = e \} \\
 & \mid \text{with } E; e \mid \text{if } E \text{ then } e \text{ else } e
 \end{aligned}$$

$$F ::= E.a \mid v.F$$