

Long-distance interaction between caller and callee

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$t ::=$		term
	v	value
	x	variable
	$t \ t$	application
	provide S as ε in t	provide
$v ::=$		value
	c	constant
	$\lambda x : \tau . t$	abstraction
$S ::=$		effect handler
	\emptyset_S	empty handler
	$S, s \mapsto t$	handler extension
$\Delta ::=$		effect context
	\emptyset_Δ	empty effect context
	$\Delta, \varepsilon = \Gamma$	effect context extension
$\tau ::=$		type
	κ	type of constants
	$\sigma \rightarrow \sigma$	arrow type
$\sigma ::=$		type with effects
	$E ! \tau$	effect annotation
$E ::=$		effect set
	\emptyset_ε	empty effect
	E, ε	effect extension
$\Gamma ::=$		context
	\emptyset_Γ	empty context
	$\Gamma, x : \tau$	variable binding

Figure 1: Syntax

$$\boxed{\Gamma \vdash t : \sigma}$$

$$\frac{}{\Gamma \vdash c : \emptyset_\varepsilon ! \kappa} \text{ (T-CONSTANT)}$$

$$\frac{x : \sigma \in \Gamma}{\Gamma \vdash x : \sigma} \text{ (T-VARIABLE)}$$

$$\frac{\Gamma, x : \tau \vdash t : \sigma}{\Gamma \vdash \lambda x : \tau . t : \tau \rightarrow \sigma} \text{ (T-ABSTRACTION)}$$

$$\frac{\Gamma \vdash t_1 : E_1 ! \tau_1 \quad \Gamma \vdash t_2 : E_2 ! (\tau_1 \rightarrow E_3 ! \tau_2)}{\Gamma \vdash t_2 t_1 : E_1, E_2, E_3 ! \tau_2} \text{ (T-APPLICATION)}$$

$$\frac{\Gamma \vdash t : E ! \tau}{\Gamma \vdash t : E, \varepsilon ! \tau} \text{ (T-WEAKEN)}$$

$$\frac{\begin{array}{l} S = \emptyset_S, s_1 \mapsto t_1, \dots, s_n \mapsto t_n \\ \Gamma \vdash t_i : E_i ! \tau_i \\ \sigma_i = E_i, \varepsilon ! \tau_i \\ \varepsilon = \emptyset_\Gamma, s_1 : \sigma_1, \dots, s_n : \sigma_n \in \Delta \\ \Gamma, s_1 : \sigma_1, \dots, s_n : \sigma_n \vdash t : E ! \tau \end{array}}{\Gamma \vdash \text{provide } S \text{ as } \varepsilon \text{ in } t : E - \varepsilon ! \tau} \text{ (T-PROVIDE)}$$

Figure 2: Typing rules