

Shell state	σ	$::=$	$\langle \text{pid}_{\text{root}}, b_{\text{outermost}}, \text{opts}, \text{jobs}, \text{traps}, \text{traps}_{\text{supershell}}^?, \rho, s_{\$*}^*, \ell^*, \mathcal{V}_{\text{ro}}, \mathcal{V}_{\text{export}}, \rho_f, \text{aliases}, \text{locale}, s_{\text{cwd}}, \text{pid}_{\$!}, n_{\$?}, n_{\text{loop}}, n_{\text{optoff}}^? \rangle$
Shell options	opts	\in	$\text{Opts} = \{\text{allexport}, \dots\}$
Traps	traps	$:$	$\text{Sig} \rightarrow s$
Jobs	jobs	$:$	$id:\mathbb{N} \rightarrow \{\text{ji} \mid \text{ji}.n_{\text{id}} = id\}$
Job info	ji	$::=$	$\langle n_{\text{id}}, (\text{pid } c)_{\text{pipe}}^*, \text{pid}, c, js \rangle$
Job status	js	$::=$	$\text{running} \mid \text{stopped} (\text{TSTP} \mid \text{STOP} \mid \text{TTIN} \mid \text{TTOU}) \mid \text{terminated sig} \mid \text{done } n_{\$?}$
Signals	sig	\in	$\text{Sig} = \{\text{SIGHUP}, \dots\}$
Global environments	ρ	$:$	$s \rightarrow s$
Local environments	ℓ	$:$	$s \rightarrow s^? \times b_{\text{ro}} \times b_{\text{export}}$
Sets of variable names	\mathcal{V}	\subseteq	$\mathcal{P}(\Sigma^+)$
Function definitions	ρ_f	$:$	$s \rightarrow c$
Aliases	aliases	$:$	$s \rightarrow s$
Locales	locale	\in	\mathcal{L} (e.g., C, it_IT.UTF-8)