seqmod

elpinal

1. External language

Module identifers	X
Signature identifers	X_s
Value identifers	X_v
Type identifers	X_t

Let δ range over $\{s, v, t\}$.

$$
\begin{array}{lcl}
K & ::= & \Omega \mid \Omega \to K \\
T & ::= & P_t \mid \texttt{pack}\ S \mid \alpha \mid \lambda\alpha.T \mid T\,T \mid T \to T \mid \texttt{unit} \mid T \,\&\, T \mid T + T \\
E & ::= & P_v \mid \texttt{pack}\ M : S \mid x \mid \lambda x.E \mid () \mid (E, E) \mid \iota_1 E \mid \iota_2 E \\
 & \mid & E\ E \mid \texttt{case}(E, ().E) \mid \pi_1 E \mid \pi_2 E \mid \texttt{case}(E, \iota_1 x.E \mid \iota_2 x.E) \\
P_\delta & ::= & X_\delta \mid M.X_\delta \\
P_m & ::= & M
\end{array}
$$

$$
\begin{array}{lcl}
M & ::= & X \mid \{B\} \mid M.X \mid \lambda X{:}S.M \mid X\ X \mid X :> S \mid \texttt{unpack}\ E : S \\
B & ::= & \texttt{val}\ X_v = E \mid \texttt{type}\ X_t = T \mid \texttt{module}\ X = M \mid \texttt{signature}\ X_s = S \\
 & \mid & \texttt{include}\ M \mid \varepsilon \mid B;B \\
S & ::= & P_s \mid \{D\} \mid (X : S) \to S \mid (X : S) \Rightarrow S \mid S\ \texttt{where type}\ \overline{X}.X_t = T \\
 & \mid & S\ \texttt{where val}\ \overline{X}.X_v = P_v \mid S\ \texttt{where module}\ \overline{X}.X = P_m \mid \texttt{like}\ P_m \\
D & ::= & \texttt{val}\ X_v : \forall\overline{\alpha}.T \mid \texttt{val}\ X_v = P_v \mid \texttt{type}\ X_t = T \mid \texttt{type}\ X_t : K \mid \texttt{module}\ X : S \\
 & \mid & \texttt{module}\ X = P_m \mid \texttt{signature}\ X_s = S \mid \texttt{include}\ S \mid \varepsilon \mid D;D
\end{array}
$$

1.1. Semantic signatures

$$
\begin{aligned}
\Sigma &::= [= \pi : \forall\overline{\alpha}.\tau] \mid [= \tau : \kappa] \mid [= \Xi] \mid \left\{\overline{l : \Sigma}\right\} \mid \forall\overline{\alpha}.\Sigma \rightarrow_{\mathtt{I}} \Xi \mid \forall\overline{\alpha}.\Sigma \rightarrow_{\mathtt{P}} \Sigma \\
\Xi &::= \exists\overline{\alpha}.\Sigma \\
\varphi &::= \mathtt{I} \mid \mathtt{P} \\
\pi &::= \alpha \mid \pi\ \overline{\tau}
\end{aligned}
$$

2. Internal language

In addition to the constructs of L^N_{ML}, we use $\otimes$-records to represent structures.

$$
\begin{aligned}
v &::= \ \dots \mid \{l_i = v_i\}_i \\
k^+ &::= \ \dots \mid \mu\{l_i = x\}_i.c
\end{aligned}
$$