

possible-world^{11,40}

PossibleWorld($D;w$)

$\equiv_{\text{def}}$ FairFifo

$\& ((\forall i, x:\text{Id. } \text{vartype}(i;x) \subseteq_r M(i).\text{ds}(x))$
 $\quad c \wedge (\forall i:\text{Id}, a:\text{Action}(i). (\neg(\uparrow \text{isnull}(a))) \Rightarrow (\text{valtype}(i;a) \subseteq_r M(i).\text{da}(\text{kind}(a))))$
 $\quad c \wedge (\forall l:\text{IdLnk}, tg:\text{Id. } (w.M(l,tg)) \subseteq_r M(\text{source}(l)).\text{da}(\text{rcv}(l,tg)))$
 $\quad c \wedge (\forall i, x:\text{Id. } M(i).\text{init}(x,s(i;0).x))$
 $\quad c \wedge (\forall i:\text{Id}, t:\mathbb{N}.$
 $\quad \quad (\neg(\uparrow \text{isnull}(a(i;t))))$
 $\quad \Rightarrow (((\uparrow \text{islocal}(\text{kind}(a(i;t))))$
 $\quad \quad \Rightarrow (M(i).\text{pre}(\text{act}(\text{kind}(a(i;t))), \text{read-state}(\lambda x.s(i;t).x))$
 $\quad \quad \quad \& \text{ma-random}(M(i);$
 $\quad \quad \quad \quad \text{valtype}(i;a(i;t));$
 $\quad \quad \quad \quad \text{val}(a(i;t));i;\text{act}(\text{kind}(a(i;t));w.\text{knum}(w;i;\text{kind}(a(i;t));t))))$
 $\quad \& (\forall x:\text{Id}.$
 $\quad \quad M(i).\text{ef}(\text{kind}(a(i;t)),$
 $\quad \quad \quad x, \text{read-state}(\lambda x.s(i;t).x), \text{val}(a(i;t)), \lambda q.s(i;t+1).x(q-1)))$
 $\quad \& (\forall l:\text{IdLnk}.$
 $\quad \quad M(i).\text{send}(\text{kind}(a(i;t));$
 $\quad \quad \quad l; \text{read-state}(\lambda x.s(i;t).x); \text{val}(a(i;t)); \text{withlnk}(l;m(i;t));i))$
 $\quad \& (\forall x:\text{Id}.$
 $\quad \quad (\neg M(i).\text{frame}(\text{kind}(a(i;t)) \text{ affects } x))$
 $\quad \quad \Rightarrow (\forall r:\mathbb{Q}. s(i;t).x(r+1) = s(i;t+1).x(r)))$
 $\quad \& (\forall l:\text{IdLnk}, tg:\text{Id}.$
 $\quad \quad (\neg M(i).\text{sframe}(\text{kind}(a(i;t)) \text{ sends } \langle l, tg \rangle))$
 $\quad \quad \Rightarrow (w.\text{tagged}(tg; \text{onlnk}(l;m(i;t))) = []))$
 $c \wedge ((\forall i, a:\text{Id}, t:\mathbb{N}.$
 $\quad \exists t':\mathbb{N}$
 $\quad ((t \leq t')$
 $\quad \& (((\neg(\uparrow \text{isnull}(a(i;t')))) \wedge (\text{kind}(a(i;t')) = \text{locl}(a)))$
 $\quad \quad \vee (\neg a \text{ declared in } M(i))$
 $\quad \quad \vee \text{unsolvable } M(i).\text{pre}(a, \text{read-state}(\lambda x.s(i;t').x))))$
 $\quad \& (\forall i:\text{Id}, t:\mathbb{N}.$
 $\quad \quad (\neg(\uparrow \text{isnull}(a(i;t))))$
 $\quad \quad \Rightarrow (\forall x:\text{Id}.$
 $\quad \quad \quad (\neg M(i).\text{aframe}(\text{kind}(a(i;t)) \text{ affects } x))$
 $\quad \quad \quad \Rightarrow (\forall r:\mathbb{Q}. s(i;t).x(r+1) = s(i;t+1).x(r)))$
 $\quad \& (\forall i, x:\text{Id}, k:\text{Knd}.$
 $\quad \quad (\neg M(i).\text{rframe}(k \text{ reads } x)) \Rightarrow w.\text{machine-independent}(w;i;k;x))$
 $\quad \& (\forall i:\text{Id}, t:\mathbb{N}.$
 $\quad \quad (\neg(\uparrow \text{isnull}(a(i;t))))$
 $\quad \quad \Rightarrow (\forall l:\text{IdLnk}.$
 $\quad \quad \quad (\neg M(i).\text{bframe}(\text{kind}(a(i;t)) \text{ sends on } l)) \Rightarrow (\text{onlnk}(l;m(i;t)) = []))))$

clarification:

$$\begin{aligned}
& \text{possible-world}\{i:l\} \\
& \quad (D; w) \\
& \equiv_{\text{def}} \text{fair-fifo}\{i:l\} \\
& \quad (w) \\
& \quad \& ((\forall i:\text{Id}, x:\text{Id}. \text{w-vartype}(w; i; x) \subseteq_r \text{d-m}(D; i).\text{ds}(x)) \\
& \quad \quad c \wedge (\forall i:\text{Id}, a:\text{w-action}(w; i). \\
& \quad \quad \quad (\neg(\uparrow \text{w-isnull}(w; a))) \Rightarrow (\text{w-valtype}(w; i; a) \subseteq_r \text{d-m}(D; i).\text{da}(\text{w-kind}(w; a)))) \\
& \quad \quad c \wedge (\forall l:\text{IdLnk}, tg:\text{Id}. (w.\text{M}(l, tg)) \subseteq_r \text{d-m}(D; \text{source}(l)).\text{da}(\text{rcv}(l, tg))) \\
& \quad \quad c \wedge (\forall i:\text{Id}, x:\text{Id}. \text{d-m}(D; i).\text{init}(x, \text{w-s}(w; i; 0; x))) \\
& \quad \quad c \wedge (\forall i:\text{Id}, t:\mathbb{N}. \\
& \quad \quad \quad (\neg(\uparrow \text{w-isnull}(w; \text{w-a}(w; i; t)))) \\
& \quad \quad \Rightarrow (((\uparrow \text{islocal}(\text{w-kind}(w; \text{w-a}(w; i; t)))) \\
& \quad \quad \Rightarrow (\text{d-m}(D; i).\text{pre}(\text{act}(\text{w-kind}(w; \text{w-a}(w; i; t))), \\
& \quad \quad \quad \text{read-state}(\lambda x. \text{w-s}(w; i; t; x))) \\
& \quad \quad \quad \& \text{ma-random}(\text{d-m}(D; i); \\
& \quad \quad \quad \quad \text{w-valtype}(w; i; \text{w-a}(w; i; t)); \\
& \quad \quad \quad \quad \text{w-val}(w; \text{w-a}(w; i; t)); \\
& \quad \quad \quad \quad i; \\
& \quad \quad \quad \quad \text{act}(\text{w-kind}(w; \text{w-a}(w; i; t))); \\
& \quad \quad \quad \quad \text{w-knum}(w; i; \text{w-kind}(w; \text{w-a}(w; i; t)); t)))) \\
& \quad \& (\forall x:\text{Id}. \\
& \quad \quad \text{d-m}(D; i).\text{ef}(\text{w-kind}(w; \text{w-a}(w; i; t)), \\
& \quad \quad \quad x, \\
& \quad \quad \quad \text{read-state}(\lambda x. \text{w-s}(w; i; t; x)), \\
& \quad \quad \quad \text{w-val}(w; \text{w-a}(w; i; t)), \lambda q. \text{w-s}(w; i; (t+1); x)(q - 1))) \\
& \quad \& (\forall l:\text{IdLnk}. \\
& \quad \quad \text{d-m}(D; i).\text{send}(\text{w-kind}(w; \text{w-a}(w; i; t)); \\
& \quad \quad \quad l; \\
& \quad \quad \quad \text{read-state}(\lambda x. \text{w-s}(w; i; t; x)); \\
& \quad \quad \quad \text{w-val}(w; \text{w-a}(w; i; t)); \text{withlnk}(l; \text{w-m}(w; i; t)); i)) \\
& \quad \& (\forall x:\text{Id}. \\
& \quad \quad (\neg \text{d-m}(D; i).\text{frame}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ affects } x)) \\
& \quad \quad \Rightarrow (\forall r:\mathbb{Q}. \\
& \quad \quad \quad \text{w-s}(w; i; t; x)(r + 1) = \text{w-s}(w; i; (t+1); x)(r) \in \text{w-vartype}(w; i; x))) \\
& \quad \& (\forall l:\text{IdLnk}, tg:\text{Id}. \\
& \quad \quad (\neg \text{d-m}(D; i).\text{sframe}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ sends } \langle l, tg \rangle)) \\
& \quad \quad \Rightarrow (\text{w-tagged}(tg; \text{onlylnk}(l; \text{w-m}(w; i; t))) = [] \in (\text{w-Msg}(w) \text{ List})))) \\
& c \wedge ((\forall i:\text{Id}, a:\text{Id}, t:\mathbb{N}. \\
& \quad \exists t':\mathbb{N} \\
& \quad \quad ((t \leq t') \\
& \quad \& (((\neg(\uparrow \text{w-isnull}(w; \text{w-a}(w; i; t'))))) \\
& \quad \quad c \wedge (\text{w-kind}(w; \text{w-a}(w; i; t')) = \text{locl}(a) \in \text{Knd})) \\
& \quad \quad \vee (\neg a \text{ declared in } \text{d-m}(D; i)))
\end{aligned}$$

$$\begin{aligned}
& \vee \text{unsolvable } d\text{-m}(D; i).\text{pre}(a, \text{read-state}(\lambda x. w\text{-s}(w; i; t'; x)))))) \\
& \& (\forall i:\text{Id}, t:\mathbb{N}. \\
& \quad (\neg(\uparrow w\text{-isnull}(w; w\text{-a}(w; i; t)))) \\
& \quad \Rightarrow (\forall x:\text{Id}. \\
& \quad \quad (d\text{-m}(D; i).\text{aframe}(w\text{-kind}(w; w\text{-a}(w; i; t)) \text{ affects } x)) \\
& \quad \quad \Rightarrow (\forall r:\mathbb{Q}. \\
& \quad \quad \quad w\text{-s}(w; i; t; x)(r + 1) \\
& \quad \quad \quad = \\
& \quad \quad \quad w\text{-s}(w; i; (t+1); x)(r) \\
& \quad \quad \quad \in w\text{-vartype}(w; i; x)))))) \\
& \& (\forall i:\text{Id}, x:\text{Id}, k:\text{Knd}. \\
& \quad (\neg d\text{-m}(D; i).\text{rframe}(k \text{ reads } x)) \Rightarrow w\text{-machine-independent}(w; i; k; x)) \\
& \& (\forall i:\text{Id}, t:\mathbb{N}. \\
& \quad (\neg(\uparrow w\text{-isnull}(w; w\text{-a}(w; i; t)))) \\
& \quad \Rightarrow (\forall l:\text{IdLnk}. \\
& \quad \quad (d\text{-m}(D; i).\text{bframe}(w\text{-kind}(w; w\text{-a}(w; i; t)) \text{ sends on } l)) \\
& \quad \quad \Rightarrow (\text{onlnk}(l; w\text{-m}(w; i; t)) = [] \in (w\text{-Msg}(w) \text{ List}))))))
\end{aligned}$$