

possible-world^{0,22}

PossibleWorld($D;w$)

\equiv_{def} FairFifo

$$\begin{aligned}
& \& (\forall i, x:\text{Id}. \text{vartype}(i;x) \subseteq \rho \text{M}(i).\text{ds}(x)) \\
& \& (\forall i:\text{Id}, a:\text{Action}(i). \neg \text{isnull}(a) \Rightarrow \text{valtype}(i;a) \subseteq \rho \text{M}(i).\text{da}(\text{kind}(a))) \\
& \& (\forall l:\text{IdLnk}, tg:\text{Id}. (w.\text{M}(l,tg)) \subseteq \rho \text{M}(\text{source}(l)).\text{da}(\text{rcv}(l,tg))) \\
& \& (\forall i, x:\text{Id}. \text{M}(i).\text{init}(x,s(i;0).x)) \\
& \& (\forall i:\text{Id}, t:\mathbb{N}. \\
& \quad \neg \text{isnull}(a(i;t)) \\
& \quad \Rightarrow (\text{islocal}(\text{kind}(a(i;t))) \\
& \quad \quad \Rightarrow \text{M}(i).\text{pre}(\text{act}(\text{kind}(a(i;t))), \lambda x.s(i;t).x, \text{val}(a(i;t)))) \\
& \quad \& (\forall x:\text{Id}. \text{M}(i).\text{ef}(\text{kind}(a(i;t)), x, \lambda x.s(i;t).x, \text{val}(a(i;t)), s(i;t+1).x)) \\
& \quad \& (\forall l:\text{IdLnk}. \\
& \quad \quad \text{M}(i).\text{send}(\text{kind}(a(i;t)); l; \lambda x.s(i;t).x; \text{val}(a(i;t)); \text{withlnk}(l; \text{m}(i;t)); i)) \\
& \quad \& (\forall x:\text{Id}. \neg \text{M}(i).\text{frame}(\text{kind}(a(i;t)) \text{ affects } x) \Rightarrow s(i;t).x = s(i;t+1).x) \\
& \quad \& (\forall l:\text{IdLnk}, tg:\text{Id}. \\
& \quad \quad \neg \text{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; \text{m}(i;t))) = \text{nil})) \\
& \& (\forall i, a:\text{Id}, t:\mathbb{N}. \\
& \quad \exists t':\mathbb{N}. \\
& \quad t \leq t' \\
& \quad \& \neg \text{isnull}(a(i;t')) \& \text{kind}(a(i;t')) = \text{locl}(a) \\
& \quad \quad \vee \neg a \text{ declared in } \text{M}(i) \\
& \quad \quad \vee \text{unsolvable } \text{M}(i).\text{pre}(a, \lambda x.s(i;t').x)) \\
& \& (\forall i:\text{Id}, t:\mathbb{N}. \\
& \quad \neg \text{isnull}(a(i;t)) \\
& \quad \Rightarrow (\forall x:\text{Id}. \neg \text{M}(i).\text{aframe}(\text{kind}(a(i;t)) \text{ affects } x) \Rightarrow s(i;t).x = s(i;t+1).x)) \\
& \& (\forall i, x:\text{Id}, k:\text{Knd}. \neg \text{M}(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 \text{isnull}(a(i;t)) \\
& \quad \Rightarrow (\forall l:\text{IdLnk}. \neg \text{M}(i).\text{bframe}(\text{kind}(a(i;t)) \text{ sends on } l) \Rightarrow \text{onlnk}(l; \text{m}(i;t)) = \text{nil}))
\end{aligned}$$

clarification:

possible-world $\{i:l\}$

($D; w$)

\equiv_{def} fair-fifo $\{i:l\}$

(w)

$$\begin{aligned}
& \& (\forall i:\text{Id}, x:\text{Id}. w\text{-vartype}(w; i; x) \subseteq \rho \text{d-m}(D; i).\text{ds}(x)) \\
& \& (\forall i:\text{Id}, a:w\text{-action}(w; i). \\
& \quad \neg w\text{-isnull}(w; a) \Rightarrow w\text{-valtype}(w; i; a) \subseteq \rho \text{d-m}(D; i).\text{da}(w\text{-kind}(w; a))) \\
& \& (\forall l:\text{IdLnk}, tg:\text{Id}. (w.\text{M}(l,tg)) \subseteq \rho \text{d-m}(D; \text{source}(l)).\text{da}(\text{rcv}(l,tg))) \\
& \& (\forall i:\text{Id}, x:\text{Id}. \text{d-m}(D; i).\text{init}(x, w\text{-s}(w; i; 0; x)))
\end{aligned}$$

$\& (\forall i:\text{Id}, t:\mathbb{N}.$
 $\neg \text{w-isnull}(w; \text{w-a}(w; i; t))$
 $\Rightarrow (\text{islocal}(\text{w-kind}(w; \text{w-a}(w; i; t)))$
 $\Rightarrow \text{d-m}(D; i).\text{pre}(\text{act}(\text{w-kind}(w; \text{w-a}(w; i; t))),$
 $\lambda x.\text{w-s}(w; i; t; x), \text{w-val}(w; \text{w-a}(w; i; t))))$
 $\& (\forall x:\text{Id}.$
 $\text{d-m}(D; i).\text{ef}(\text{w-kind}(w; \text{w-a}(w; i; t)),$
 $x, \lambda x.\text{w-s}(w; i; t; x), \text{w-val}(w; \text{w-a}(w; i; t)), \text{w-s}(w; i; (t+1); x))$
 $\& (\forall l:\text{IdLnk}.$
 $\text{d-m}(D; i).\text{send}(\text{w-kind}(w; \text{w-a}(w; i; t));$
 $l; \lambda x.\text{w-s}(w; i; t; x); \text{w-val}(w; \text{w-a}(w; i; t)); \text{withlnk}(l; \text{w-m}(w; i; t); i))$
 $\& (\forall x:\text{Id}.$
 $\neg \text{d-m}(D; i).\text{frame}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ affects } x)$
 $\Rightarrow \text{w-s}(w; i; t; x) = \text{w-s}(w; i; (t+1); x) \in \text{d-m}(D; i).\text{ds}(x))$
 $\& (\forall l:\text{IdLnk}, tg:\text{Id}.$
 $\neg \text{d-m}(D; i).\text{sframe}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ sends } \langle l, tg \rangle)$
 $\Rightarrow \text{w-tagged}(tg; \text{onlnk}(l; \text{w-m}(w; i; t))) = \text{nil} \in \text{w-Msg}(w) \text{ List}))$
 $\& (\forall i:\text{Id}, a:\text{Id}, t:\mathbb{N}.$
 $\exists t':\mathbb{N}.$
 $t \leq t'$
 $\& \neg \text{w-isnull}(w; \text{w-a}(w; i; t')) \& \text{w-kind}(w; \text{w-a}(w; i; t')) = \text{locl}(a) \in \text{Knd}$
 $\vee \neg a \text{ declared in } \text{d-m}(D; i)$
 $\vee \text{unsolvable } \text{d-m}(D; i).\text{pre}(a, \lambda x.\text{w-s}(w; i; t'; x))$
 $\& (\forall i:\text{Id}, t:\mathbb{N}.$
 $\neg \text{w-isnull}(w; \text{w-a}(w; i; t))$
 $\Rightarrow (\forall x:\text{Id}.$
 $\neg \text{d-m}(D; i).\text{aframe}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ affects } x)$
 $\Rightarrow \text{w-s}(w; i; t; x) = \text{w-s}(w; i; (t+1); x) \in \text{w-vartype}(w; i; x))$
 $\& (\forall i:\text{Id}, x:\text{Id}, k:\text{Knd}.$
 $\neg \text{d-m}(D; i).\text{rframe}(k \text{ reads } x) \Rightarrow \text{w-machine-independent}(w; i; k; x)$
 $\& (\forall i:\text{Id}, t:\mathbb{N}.$
 $\neg \text{w-isnull}(w; \text{w-a}(w; i; t))$
 $\Rightarrow (\forall l:\text{IdLnk}.$
 $\neg \text{d-m}(D; i).\text{bframe}(\text{w-kind}(w; \text{w-a}(w; i; t)) \text{ sends on } l)$
 $\Rightarrow \text{onlnk}(l; \text{w-m}(w; i; t)) = \text{nil} \in \text{w-Msg}(w) \text{ List}))$