[*String*]

Writer

$$NameW : String$$

Reviewer

$$NameR : String$$

Section

$$NameS : String$$

$$S1, S2, S3, S4 : Section$$

$$S1 \neq S2$$
$$S2 \neq S3$$
$$S1 \neq S3$$

$$w1, w2 : Writer$$
$$r1, r2 : Reviewer$$

$$w1 \neq w2$$
$$r1 \neq r2$$

CollaborativeAuthoringSystem

$$writers : \mathbb{F}\ Writer$$
$$reviewers : \mathbb{F}\ Reviewer$$
$$sections : \mathbb{F}\ Section$$
$$WriterSection : Writer \leftrightarrow Section$$
$$ReviewerSection : Reviewer \leftrightarrow Section$$

$$\mathrm{dom}\ ReviewerSection \subseteq reviewers$$
$$\mathrm{ran}\ ReviewerSection \subseteq sections$$
$$\mathrm{dom}\ WriterSection \subseteq writers$$
$$\mathrm{ran}\ WriterSection \subseteq sections$$
$$\#\ reviewers < 5$$
$$\#\ writers < 6$$
$$\#\ sections < 5$$
$$\#\ (writers \lhd WriterSection) < 3$$
$$\#\ ((ReviewerSection\ (\!|\ reviewers\ |\!)) \cup (WriterSection\ (\!|\ writers\ |\!))) < 4$$
$$\forall w : writers \bullet \#\ (WriterSection\ (\!|\ \{w\}\ |\!)) \leqslant 1$$
$$\forall r : reviewers \bullet \#\ (ReviewerSection\ (\!|\ \{r\}\ |\!)) \leqslant 1$$
$$\forall w, ww : writers; s : sections \mid w \neq ww \bullet (w, s) \notin WriterSection \lor (ww, s) \notin WriterSection$$
$$\forall r, rr : reviewers; s : sections \mid r \neq rr \bullet (r, s) \notin ReviewerSection \lor (rr, s) \notin ReviewerSection$$
$$\forall r : reviewers; w : writers; s : sections \bullet (w, s) \notin WriterSection \lor (r, s) \notin ReviewerSection$$

InitCASystem

CollaborativeAuthoringSystem

$writers = \{w1, w2\}$
$reviewers = \{r1\}$
$sections = \{S1, S2, S3\}$
$WriterSection = \{(w1, S1), (w2, S3)\}$
$ReviewerSection = \{(r1, S2)\}$

theorem *ConsistencyCASystem*
$\exists CollaborativeAuthoringSystem \bullet InitCASystem$

InsertWriter

$w?: Writer$
$\Delta CollaborativeAuthoringSystem$

$w? \notin writers$
$\#(writers \setminus \text{dom } WriterSection) < 2$
$writers' = writers \cup \{w?\}$
$reviewers' = reviewers$
$sections' = sections$
$WriterSection' = WriterSection$
$ReviewerSection' = ReviewerSection$

theorem *PreInsertWriter*
$\forall CollaborativeAuthoringSystem; w?: Writer$
$\mid w? \notin writers$
$\land \#(writers \cup \{w?\}) < 5$
$\land (\forall rr: reviewers; ww: writers \cup \{w?\}; ss: Section$
$\mid (rr, ss) \in ReviewerSection \bullet (ww, ss) \notin WriterSection)$
$\land (\forall ww1: writers \cup \{w?\}; ww2: writers \cup \{w?\}; ss: Section$
$\mid ww1 \neq ww2 \land (ww2, ss) \in WriterSection$
$\bullet (ww2, ss) \notin WriterSection) \bullet \text{pre } InsertWriter$

DeleteWriter

$w?: Writer$
$\Delta CollaborativeAuthoringSystem$

$w? \in writers$
$w? \notin \text{dom } WriterSection$
$writers' = writers \setminus \{w?\}$
$reviewers' = reviewers$
$sections' = sections$
$WriterSection' = WriterSection$
$ReviewerSection' = ReviewerSection$

theorem *PreDeleteWriter*
$\forall CollaborativeAuthoringSystem; w?: Writer$
$\mid w? \in writers$
$\land \#(writers \setminus \{w?\}) < 5$

$\wedge$ *w?* $\notin$ dom *WriterSection*
$\wedge$ dom *WriterSection* $\in \mathbb{P}$ (*writers* $\setminus$ {*w?*})
$\wedge$ ($\forall$ *rr: reviewers; ww: writers* $\setminus$ {*w?*}*; ss: Section*
| (*rr*, *ss*) $\in$ *ReviewerSection* • (*ww*, *ss*) $\notin$ *WriterSection*)
$\wedge$ ($\forall$ *ww1: writers* $\setminus$ {*w?*}*; ww2: writers* $\setminus$ {*w?*}*; ss: Section*
| *ww1* $\neq$ *ww2* $\wedge$ (*ww2*, *ss*) $\in$ *WriterSection*
• (*ww2*, *ss*) $\notin$ *WriterSection*) • pre *DeleteWriter*

InsertReviewer

r?: Reviewer
Δ*CollaborativeAuthoringSystem*

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r? $\notin$ *reviewers*
(*reviewers* $\setminus$ dom *ReviewerSection*) < 2
reviewers' = reviewers $\cup$ {*r?*}
writers' = writers
sections' = sections
WriterSection' = WriterSection
ReviewerSection' = ReviewerSection

DeleteReviewer

r?: Reviewer
Δ*CollaborativeAuthoringSystem*

---

r? $\in$ *reviewers*
r? $\notin$ dom *ReviewerSection*
reviewers' = reviewers $\setminus$ {*r?*}
writers' = writers
sections' = sections
WriterSection' = WriterSection
ReviewerSection' = ReviewerSection

ConnectWriter

w?: Writer
s?: Section
Δ*CollaborativeAuthoringSystem*

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w? $\in$ *writers*
s? $\in$ *sections*
WriterSection' = WriterSection $\cup$ {(*w?*, *s?*)}
reviewers' = reviewers
writers' = writers
sections' = sections
ReviewerSection' = ReviewerSection

theorem *PreConnectWriter*
$\forall$ *CollaborativeAuthoringSystem; w?: Writer; s?: Section*
| *w?* $\in$ *writers*
$\wedge$ *s?* $\in$ *sections*
$\wedge$ ($\forall$ *rr: reviewers* • (*rr*, *s?*) $\notin$ *ReviewerSection*)

$\wedge$ ($\forall ww$: *writers* • ($ww \neq w? \wedge (ww, s?) \notin$ *WriterSection*))
• pre *ConnectWriter*

DisconnectWriter

w?: Writer
s?: Section
Δ*CollaborativeAuthoringSystem*

$w? \in$ *writers*
$s? \in$ *sections*
$(w?, s?) \in$ *WriterSection*
WriterSection' = *WriterSection* $\setminus \{(w?, s?)\}$
sections' = *sections*
reviewers' = *reviewers*
writers' = *writers*
ReviewerSection' = *ReviewerSection*

theorem *PreDisconnectWriter*
$\forall$*CollaborativeAuthoringSystem; w?: Writer; s?: Section*
| $w? \in$ *writers* $\wedge$ $s? \in$ *sections* • pre *DisconnectWriter*

InsertSection

s?: Section
Δ*CollaborativeAuthoringSystem*

$s? \notin$ *sections*
sections' = *sections* $\cup \{s?\}$
reviewers' = *reviewers*
writers' = *writers*
WriterSection' = *WriterSection*
ReviewerSection' = *ReviewerSection*

DeleteSection

s?: Section
Δ*CollaborativeAuthoringSystem*

$s? \in$ *sections*
$s? \notin$ ran *WriterSection*
$s? \notin$ ran *ReviewerSection*
sections' = *sections* $\setminus \{s?\}$
reviewers' = *reviewers*
writers' = *writers*
WriterSection' = *WriterSection*
ReviewerSection' = *ReviewerSection*

ConnectReviewer

r?: Reviewer
s?: Section
Δ*CollaborativeAuthoringSystem*

$r? \in reviewers$
$s? \in sections$
$\#(ReviewerSection \rhd \{reviewers\}) < 4$
$WriterSection' = WriterSection$
$reviewers' = reviewers$
$writers' = writers$
$sections' = sections$
$ReviewerSection' = ReviewerSection \cup \{(r?, s?)\}$

DisconnectReviewer

$r?: Reviewer$
$s?: Section$
$\Delta CollaborativeAuthoringSystem$

$r? \in reviewers$
$s? \in sections$
$(r?, s?) \in ReviewerSection$
$WriterSection' = WriterSection$
$sections' = sections$
$reviewers' = reviewers$
$writers' = writers$
$ReviewerSection' = ReviewerSection \setminus \{(r?, s?)\}$