

[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: $\text{Writer} \leftrightarrow \text{Section}$

ReviewerSection: $\text{Reviewer} \leftrightarrow \text{Section}$

$\text{dom ReviewerSection} \subseteq \text{reviewers}$

$\text{ran ReviewerSection} \subseteq \text{sections}$

$\text{dom WriterSection} \subseteq \text{writers}$

$\text{ran WriterSection} \subseteq \text{sections}$

$\# \text{reviewers} < 5$

$\# \text{writers} < 6$

$\# \text{sections} < 5$

$\# (\text{writers} \triangleleft \text{WriterSection}) < 3$

$\# ((\text{ReviewerSection} (\text{reviewers})) \cup (\text{WriterSection} (\text{writers}))) < 4$

$\forall w: \text{writers} \cdot \# (\text{WriterSection} (\{w\})) \leq 1$

$\forall r: \text{reviewers} \cdot \# (\text{ReviewerSection} (\{r\})) \leq 1$

$\forall w, ww: \text{writers}; s: \text{sections} \mid w \neq ww$

$\bullet (w, s) \notin \text{WriterSection} \vee (ww, s) \notin \text{WriterSection}$

$\forall r, rr: \text{reviewers}; s: \text{sections} \mid r \neq rr$

$\bullet (r, s) \notin \text{ReviewerSection} \vee (rr, s) \notin \text{ReviewerSection}$

$\forall r: \text{reviewers}; w: \text{writers}; s: \text{sections}$

$\bullet (w, s) \notin \text{WriterSection} \vee (r, s) \notin \text{ReviewerSection}$

<i>InitCASystem</i>
<i>CollaborativeAuthoringSystem</i>
$writers = \{w1, w2\}$ $reviewers = \{r1\}$ $sections = \{S1, S2, S3\}$ $WriterSection = \{(w1, S1), (w2, S3)\}$ $ReviewerSection = \{(r1, S2)\}$

theorem *ConsistencyCASystem*

$\exists CollaborativeAuthoringSystem \bullet InitCASystem$

<i>InsertWriter</i>
$w?: Writer$ $\Delta CollaborativeAuthoringSystem$
$w? \notin writers$ $\#(writers \setminus \text{dom } WriterSection) < 2$ $writers' = writers \cup \{w?\}$ $reviewers' = reviewers$ $sections' = sections$ $WriterSection' = WriterSection$ $ReviewerSection' = ReviewerSection$

theorem *PreInsertWriter*

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

<i>DeleteWriter</i>
$w?: Writer$ $\Delta CollaborativeAuthoringSystem$
$w? \in writers$ $w? \notin \text{dom } WriterSection$ $writers' = writers \setminus \{w?\}$ $reviewers' = reviewers$ $sections' = sections$ $WriterSection' = WriterSection$ $ReviewerSection' = ReviewerSection$

theorem *PreDeleteWriter*

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

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

InsertReviewer

$r?: \text{Reviewer}$
 $\Delta \text{CollaborativeAuthoringSystem}$

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

DeleteReviewer

$r?: \text{Reviewer}$
 $\Delta \text{CollaborativeAuthoringSystem}$

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

ConnectWriter

$w?: \text{Writer}$
 $s?: \text{Section}$
 $\Delta \text{CollaborativeAuthoringSystem}$

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

theorem *PreConnectWriter*

$\forall \text{CollaborativeAuthoringSystem}; w?: \text{Writer}; s?: \text{Section}$
 $\quad | w? \in \text{writers}$
 $\quad \wedge s? \in \text{sections}$
 $\quad \wedge (\forall rr: \text{reviewers} \bullet (rr, s?) \notin \text{ReviewerSection})$

- $\wedge (\forall ww: \text{writers} \bullet (ww \neq w? \wedge (ww, s?) \notin \text{WriterSection}))$
- *pre ConnectWriter*

DisconnectWriter

w?: Writer
s?: Section
 $\Delta \text{CollaborativeAuthoringSystem}$

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

theorem *PreDisconnectWriter*

$\forall \text{CollaborativeAuthoringSystem}; w?: \text{Writer}; s?: \text{Section}$
 $\mid w? \in \text{writers} \wedge s? \in \text{sections} \bullet \text{pre DisconnectWriter}$

InsertSection

s?: Section
 $\Delta \text{CollaborativeAuthoringSystem}$

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

DeleteSection

s?: Section
 $\Delta \text{CollaborativeAuthoringSystem}$

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

ConnectReviewer

r?: Reviewer
s?: Section
 $\Delta \text{CollaborativeAuthoringSystem}$

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

DisconnectReviewer

$r?: \text{Reviewer}$
 $s?: \text{Section}$
 $\Delta \text{CollaborativeAuthoringSystem}$

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