aircraft

Tight Rope v0.6

October 22, 2015

1 Network

section *NetworkChannels* **parents** *scj_prelude*, *MissionId*, *MissionIds*, *SchedulableId*, *SchedulableIds*, *MissionChan*, *SchedulableChan*, *TopLevelMissionSequencerFWChan*, *FrameworkChan*, *SafeletChan*

channelset *TerminateSync* ==
{| *schedulables_terminated*, *schedulables_stopped*, *get_activeSchedulables* |}

channelset *ControlTierSync* ==
{| *start_toplevel_sequencer*, *done_toplevel_sequencer*, *done_safeletFW* |}

channelset *TierSync* ==
{| *start_mission* . , *done_mission* . ,
done_safeletFW , *done_toplevel_sequencer* |}

channelset *MissionSync* ==
{| *done_safeletFW* , *done_toplevel_sequencer*, *register*,
signalTerminationCall, *signalTerminationRet*, *activate_schedulables*, *done_schedulable*,
cleanupSchedulableCall, *cleanupSchedulableRet* |}

channelset *SchedulablesSync* ==
{| *activate_schedulables*, *done_safeletFW* , *done_toplevel_sequencer* |}

channelset *ClusterSync* ==
{| *done_toplevel_sequencer*, *done_safeletFW* |}

channelset *AppSync* ==
$\bigcup$ {*SafeltAppSync*, *MissionSequencerAppSync*, *MissionAppSync*,
MTAppSync, *OSEHSync*, *APEHSync*,
{| *getSequencer*, *end_mission_app*, *end_managedThread_app*,
setCeilingPriority, *requestTerminationCall*, *requestTerminationRet*, *terminationPendingCall*,
terminationPendingRet, *handleAsyncEventCall*, *handleAsyncEventRet* |}}

channelset *ObjectSync* ==
{| |}

channelset *ThreadSync* ==
{| |}

channelset *LockingSync* ==
{| *lockAcquired*, *startSyncMeth*, *endSyncMeth*, *waitCall*, *waitRet*, *notify* |}

section *Program* **parents** *scj_prelude*, *MissionId*, *MissionIds*,
SchedulableId, *SchedulableIds*, *MissionChan*, *SchedulableMethChan*, *MissionFW*,
SafeletFW, *TopLevelMissionSequencerFW*, *NetworkChannels*, *ManagedThreadFW*,
SchedulableMissionSequencerFW, *PeriodicEventHandlerFW*, *OneShotEventHandlerFW*,
AperiodicEventHandlerFW, *ACSafeletApp*, *MainMissionSequencerApp*,
ObjectFW, *ThreadFW*, *MainMissionApp*,

process $ControlTier \mathrel{\widehat=}$
$$\left(\begin{array}{l} SafeletFW \\ \quad [\![ControlTierSync]\!] \\ TopLevelMissionSequencerFW(MainMissionSequencer) \end{array}\right)$$

process $Tier0 \mathrel{\widehat=}$
$$\left(\begin{array}{l} MissionFW(MainMission) \\ \quad [\![MissionSync]\!] \\ )(\end{array}\right)$$

process $Framework \mathrel{\widehat=}$
$$\left(\begin{array}{l} ControlTier \\ \quad [\![TierSync]\!] \\ (\ Tier0) \end{array}\right)$$

process $Application \mathrel{\widehat=}$
$$\left(\begin{array}{l} ACSafeletApp \\ ||| \\ MainMissionSequencerApp \\ ||| \\ MainMissionApp(hijac.tools.tightrope.environments.VariableEnv \bullet 8c3619e, hijac.tools.tightrope.environments.Variabl \\ ||| \end{array}\right)$$

$Locking \mathrel{\widehat=}$
$$\left(\begin{array}{l})(\\ ||| \\ \left(\begin{array}{l} ObjectFW(ACSafeletObject) \\ \quad [\![ObjectSync]\!] \\ ObjectFW(MainMissionObject) \end{array}\right) \end{array}\right)$$

process $Program \mathrel{\widehat=} Framework \ [\![\ AppSync\ ]\!]\ Application \ [\![\ LockingSync\ ]\!]\ Locking$

2 ID Files

2.1 MissionIds

section *MissionIds* **parents** *scj_prelude*, *MissionId*

$$MainMission : MissionID$$

$$distinct\langle nullMissionId, MainMission\rangle$$

2.2 SchedulablesIds

section *SchedulableIds* **parents** *scj_prelude*, *SchedulableId*

$$MainMissionSequencer : SchedulableID$$

$$distinct\langle nullSequencerId, nullSchedulableId, \rangle$$

2.3 ThreadIds

section *ThreadIds* **parents** *scj_prelude*, *GlobalTypes*

$$distinct\langle SafeletThreadId, nullThreadId, \rangle$$

2.4 ObjectIds

section *ObjectIds* **parents** *scj_prelude*, *GlobalTypes*

$$ACSafeletObject : ObjectID$$
$$MainMissionObject : ObjectID$$

$$distinct\langle ACSafeletObject, MainMissionObject\rangle$$

3 Safelet

section $ACSafeletApp$ **parents** $scj\_prelude, SchedulableId, SchedulableIds, SafeletChan$

process $ACSafeletApp \mathrel{\widehat=}$ **begin**

$$InitializeApplication \mathrel{\widehat=} \begin{pmatrix} initializeApplicationCall \longrightarrow \\ initializeApplicationRet \longrightarrow \\ \mathbf{Skip} \end{pmatrix}$$

$$GetSequencer \mathrel{\widehat=} \begin{pmatrix} getSequencerCall \longrightarrow \\ getSequencerRet\,!\,MainMissionSequencer \longrightarrow \\ \mathbf{Skip} \end{pmatrix}$$

$$Methods \mathrel{\widehat=} \begin{pmatrix} GetSequencer \\ \Box \\ InitializeApplication \end{pmatrix} ;\ Methods$$

$\bullet\ (Methods) \triangle (end\_safelet\_app \longrightarrow \mathbf{Skip})$

end

4 Top Level Mission Sequencer

section *MainMissionSequencerApp* **parents** *TopLevelMissionSequencerChan*, *MissionId*, *MissionIds*, *SchedulableId*, *MainMissionSequencerClass*

process $MainMissionSequencerApp \mathrel{\widehat=} \textbf{begin}$

State

$this : \textbf{ref}\ MainMissionSequencerClass$

state *State*

Init

$State'$

$this' = \textbf{new}\ MainMissionSequencerClass()$

$GetNextMission \mathrel{\widehat=} \textbf{var}\ ret : MissionID \bullet$
$\left(\begin{array}{l} getNextMissionCall\ .\ MainMissionSequencer \longrightarrow \\ ret := this\ .\ getNextMission(); \\ getNextMissionRet\ .\ MainMissionSequencer\,!\,ret \longrightarrow \\ \textbf{Skip} \end{array}\right)$

$Methods \mathrel{\widehat=}$
$\big(GetNextMission\big)\ ;\ \ Methods$

$\bullet\ (Init\ ;\ \ Methods) \triangle (end\_sequencer\_app\ .\ MainMissionSequencer \longrightarrow \textbf{Skip})$

end

class *MainMissionSequencerClass* $\widehat{=}$ **begin**

state *State*

$$returnedMission : \mathbb{B}$$

state *State*

initial *Init*

$$State'$$

$$returnedMission' = false$$

protected *getNextMission* $\widehat{=}$ **var** *ret* : *MissionID* •

$$\left(\begin{array}{l} \textbf{if } (\neg\ returnedMission = \textbf{True}) \longrightarrow \\ \quad \left(\begin{array}{l} this\ .\ returnedMission := true; \\ ret := MainMission \end{array}\right) \\ [] \neg\ (\neg\ returnedMission = \textbf{True}) \longrightarrow \\ \quad \left(ret := nullMissionId\right) \\ \textbf{fi} \end{array}\right)$$

• **Skip**

end

5 Missions

5.1 MainMission

section *MainMissionApp* **parents** *scj_prelude*, *MissionId*, *MissionIds*, *SchedulableId*, *SchedulableIds*, *MissionChan*, *SchedulableMethChan*, *MainMissionClass* , *MainMissionMethChan*

process $MainMissionApp \mathrel{\widehat=} storageParameters : MissionID, storageParametersSchedulable : MissionID, aCModeChange$

State

$this : \mathbf{ref}\ MainMissionClass$

state *State*

Init

$State'$

$this' = \mathbf{new}\ MainMissionClass()$

$InitializePhase \mathrel{\widehat=}$
$\left(\begin{array}{l} initializeCall\,.\,MainMission \longrightarrow \\ initializeRet\,.\,MainMission \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$CleanupPhase \mathrel{\widehat=}$
$\left(\begin{array}{l} cleanupMissionCall\,.\,MainMission \longrightarrow \\ cleanupMissionRet\,.\,MainMission\,!\,\mathbf{False} \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$getAirSpeedMeth \mathrel{\widehat=} \mathbf{var}\ ret : double \bullet$
$\left(\begin{array}{l} getAirSpeedCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getAirSpeed(); \\ getAirSpeedRet\,.\,MainMission\,!\,ret \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$getAltitudeMeth \mathrel{\widehat=} \mathbf{var}\ ret : double \bullet$
$\left(\begin{array}{l} getAltitudeCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getAltitude(); \\ getAltitudeRet\,.\,MainMission\,!\,ret \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$getCabinPressureMeth \mathrel{\widehat=} \mathbf{var}\ ret : double \bullet$
$\left(\begin{array}{l} getCabinPressureCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getCabinPressure(); \\ getCabinPressureRet\,.\,MainMission\,!\,ret \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$getEmergencyOxygenMeth \mathrel{\widehat=} \mathbf{var}\ ret : double \bullet$
$\left(\begin{array}{l} getEmergencyOxygenCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getEmergencyOxygen(); \\ getEmergencyOxygenRet\,.\,MainMission\,!\,ret \longrightarrow \\ \mathbf{Skip} \end{array}\right)$

$$getFuelRemainingMeth \mathrel{\widehat=} \textbf{var}\ ret : double \bullet \left(\begin{array}{l} getFuelRemainingCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getFuelRemaining(); \\ getFuelRemainingRet\,.\,MainMission\,!\,ret \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$getHeadingMeth \mathrel{\widehat=} \textbf{var}\ ret : double \bullet \left(\begin{array}{l} getHeadingCall\,.\,MainMission \longrightarrow \\ ret := this\,.\,getHeading(); \\ getHeadingRet\,.\,MainMission\,!\,ret \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setAirSpeedMeth \mathrel{\widehat=} \left(\begin{array}{l} setAirSpeedCall\,.\,MainMission\,?\,airSpeed \longrightarrow \\ this\,.\,setAirSpeed(airSpeed); \\ setAirSpeedRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setAltitudeMeth \mathrel{\widehat=} \left(\begin{array}{l} setAltitudeCall\,.\,MainMission\,?\,altitude \longrightarrow \\ this\,.\,setAltitude(altitude); \\ setAltitudeRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setCabinPressureMeth \mathrel{\widehat=} \left(\begin{array}{l} setCabinPressureCall\,.\,MainMission\,?\,cabinPressure \longrightarrow \\ this\,.\,setCabinPressure(cabinPressure); \\ setCabinPressureRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setEmergencyOxygenMeth \mathrel{\widehat=} \left(\begin{array}{l} setEmergencyOxygenCall\,.\,MainMission\,?\,emergencyOxygen \longrightarrow \\ this\,.\,setEmergencyOxygen(emergencyOxygen); \\ setEmergencyOxygenRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setFuelRemainingMeth \mathrel{\widehat=} \left(\begin{array}{l} setFuelRemainingCall\,.\,MainMission\,?\,fuelRemaining \longrightarrow \\ this\,.\,setFuelRemaining(fuelRemaining); \\ setFuelRemainingRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$setHeadingMeth \mathrel{\widehat=} \left(\begin{array}{l} setHeadingCall\,.\,MainMission\,?\,heading \longrightarrow \\ this\,.\,setHeading(heading); \\ setHeadingRet\,.\,MainMission \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

$$Methods \mathrel{\widehat{=}} \left(\begin{array}{l} InitializePhase \\ \Box \\ CleanupPhase \\ \Box \\ getAirSpeedMeth \\ \Box \\ getAltitudeMeth \\ \Box \\ getCabinPressureMeth \\ \Box \\ getEmergencyOxygenMeth \\ \Box \\ getFuelRemainingMeth \\ \Box \\ getHeadingMeth \\ \Box \\ setAirSpeedMeth \\ \Box \\ setAltitudeMeth \\ \Box \\ setCabinPressureMeth \\ \Box \\ setEmergencyOxygenMeth \\ \Box \\ setFuelRemainingMeth \\ \Box \\ setHeadingMeth \end{array} \right) ; \; Methods$$

• $(Init \; ; \; Methods) \triangle (end\_mission\_app \,.\, MainMission \longrightarrow \mathbf{Skip})$

end

class *MainMissionClass* $\widehat{=}$ **begin**

state *State*

$ALTITUDE\_READING\_ON\_GROUND : double$
$cabinPressure : double$
$emergencyOxygen : double$
$fuelRemaining : double$
$altitude : double$
$airSpeed : double$
$heading : double$

state *State*

initial *Init*

$State'$

$ALTITUDE\_READING\_ON\_GROUND' = 0.0$

public $getAirSpeed \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := airSpeed)$

public $getAltitude \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := altitude)$

public $getCabinPressure \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := cabinPressure)$

public $getEmergencyOxygen \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := emergencyOxygen)$

public $getFuelRemaining \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := fuelRemaining)$

public $getHeading \mathrel{\widehat{=}} \textbf{var}\ ret : double \bullet$
$(ret := heading)$

public $setAirSpeed \mathrel{\widehat{=}}$
$(this\,.\,this.airSpeed := airSpeed)$

public $setAltitude \mathrel{\widehat{=}}$
$(this\,.\,this.altitude := altitude)$

public $setCabinPressure \mathrel{\widehat{=}}$
$(this\,.\,this.cabinPressure := cabinPressure)$

public $setEmergencyOxygen \mathrel{\widehat{=}}$
$(this\,.\,this.emergencyOxygen := emergencyOxygen)$

public $setFuelRemaining \mathrel{\widehat{=}}$
$\big(this\,.\,this.fuelRemaining := fuelRemaining\big)$

public $setHeading \mathrel{\widehat{=}}$
$\big(this\,.\,this.heading := heading\big)$

- **Skip**

end

section *MainMissionMethChan* **parents** *scj_prelude*, *GlobalTypes*, *MissionId*, *SchedulableId*

channel *getAirSpeedCall* : *MissionID*
channel *getAirSpeedRet* : *MissionID* × *double*

channel *getAltitudeCall* : *MissionID*
channel *getAltitudeRet* : *MissionID* × *double*

channel *getCabinPressureCall* : *MissionID*
channel *getCabinPressureRet* : *MissionID* × *double*

channel *getEmergencyOxygenCall* : *MissionID*
channel *getEmergencyOxygenRet* : *MissionID* × *double*

channel *getFuelRemainingCall* : *MissionID*
channel *getFuelRemainingRet* : *MissionID* × *double*

channel *getHeadingCall* : *MissionID*
channel *getHeadingRet* : *MissionID* × *double*

channel *setAirSpeedCall* : *MissionID* × *double*
channel *setAirSpeedRet* : *MissionID*

channel *setAltitudeCall* : *MissionID* × *double*
channel *setAltitudeRet* : *MissionID*

channel *setCabinPressureCall* : *MissionID* × *double*
channel *setCabinPressureRet* : *MissionID*

channel *setEmergencyOxygenCall* : *MissionID* × *double*
channel *setEmergencyOxygenRet* : *MissionID*

channel *setFuelRemainingCall* : *MissionID* × *double*
channel *setFuelRemainingRet* : *MissionID*

channel *setHeadingCall* : *MissionID* × *double*
channel *setHeadingRet* : *MissionID*

5.2 Schedulables of