threeTreads Report

4th October 2016

1 ID Files

1.1 MissionIds

$\mathbf{section}\ MissionIds\ \mathbf{parents}\ scj\_prelude, MissionId$

$$
\begin{array}{|l}
MissionAMID : MissionID \\
\hline
distinct \langle nullMissionId, MissionAMID \rangle
\end{array}
$$

1.2 SchedulablesIds

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

$$
\begin{array}{|l}
mainSequencerSID : SchedulableID \\
MT1SID : SchedulableID \\
MT2SID : SchedulableID \\
MT3SID : SchedulableID \\
\hline
distinct \langle nullSequencerId, nullSchedulableId, mainSequencerSID, \\
MT1SID, MT2SID, \\
MT3SID \rangle
\end{array}
$$

2 Network

2.1 Network Channel Sets

section $NetworkChannels$ **parents** $scj\_prelude, MissionId, MissionIds,$
$SchedulableId, SchedulableIds, MissionChan, TopLevelMissionSequencerFWChan,$
$FrameworkChan, SafeletChan, AperiodicEventHandlerChan, ManagedThreadChan,$
$OneShotEventHandlerChan, PeriodicEventHandlerChan, MissionSequencerMethChan$

channelset $TerminateSync ==$
$\{\!| schedulables\_terminated, schedulables\_stopped, get\_activeSchedulables |\!\}$

channelset $ControlTierSync ==$
$\{\!| start\_toplevel\_sequencer, done\_toplevel\_sequencer, done\_safeletFW |\!\}$

channelset $TierSync ==$
$\{\!| start\_mission . MissionA, done\_mission . MissionA,$
$done\_safeletFW, done\_toplevel\_sequencer |\!\}$

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 $SafeltAppSync \mathrel{\widehat=}$
$\{\!| getSequencerCall, getSequencerRet, initializeApplicationCall, initializeApplicationRet, end\_safelet\_app |\!\}$

channelset $MissionSequencerAppSync ==$
$\{\!| getNextMissionCall, getNextMissionRet, end\_sequencer\_app |\!\}$

channelset $MissionAppSync ==$
$\{\!| initializeCall, register, initializeRet, cleanupMissionCall, cleanupMissionRet |\!\}$

channelset $AppSync ==$
$\bigcup \{ SafeltAppSync, MissionSequencerAppSync, MissionAppSync,$
$MTAppSync, OSEHSync, APEHSync, PEHSync,$
$\{\!| getSequencer, end\_mission\_app, end\_managedThread\_app,$
$setCeilingPriority, requestTerminationCall, requestTerminationRet, terminationPendingCall,$
$terminationPendingRet, handleAsyncEventCall, handleAsyncEventRet |\!\} \}$

channelset $ThreadSync ==$
$\{\!| raise\_thread\_priority, lower\_thread\_priority, isInterruptedCall, isInterruptedRet, get\_priorityLevel |\!\}$

channelset $LockingSync ==$
$\{\!| lockAcquired, startSyncMeth, endSyncMeth, waitCall, waitRet, notify, isInterruptedCall, isInterruptedRet,$
$interruptedCall, interruptedRet, done\_toplevel\_sequencer, get\_priorityLevel |\!\}$

2.2 Locking

section *NetworkLocking* **parents** *scj_prelude*, *GlobalTypes*, *FrameworkChan*, *MissionId*, *MissionIds*,
ThreadIds, *NetworkChannels*, *ObjectFW*, *ThreadFW*

process *Threads* $\widehat{=}$
$($**Skip**$)$

process *Objects* $\widehat{=}$
$($**Skip**$)$

process *Locking* $\widehat{=}$ *Threads* $[\![$ *ThreadSync* $]\!]$ *Objects*

2.3 Program

$$\begin{array}{l} \mathbf{section}\ Program\ \mathbf{parents}\ scj\_prelude, MissionId, MissionIds, \\ \quad SchedulableId, SchedulableIds, MissionChan, SchedulableMethChan, MissionFW, \\ \quad SafeletFW, TopLevelMissionSequencerFW, NetworkChannels, ManagedThreadFW, \\ \quad SchedulableMissionSequencerFW, PeriodicEventHandlerFW, OneShotEventHandlerFW, \\ \quad AperiodicEventHandlerFW, ObjectFW, ThreadFW, \\ \quad MyAppApp, mainSequencerApp, MissionAApp, MT1App, MT2App, \\ \quad MT3App \end{array}$$

$$\begin{array}{l} \mathbf{process}\ ControlTier \mathrel{\widehat=} \\ \left(\begin{array}{l} SafeletFW \\ \quad \llbracket ControlTierSync \rrbracket \\ TopLevelMissionSequencerFW(mainSequencer) \end{array}\right) \end{array}$$

$$\begin{array}{l} \mathbf{process}\ Tier0 \mathrel{\widehat=} \\ \left(\begin{array}{l} MissionFW(MissionAID) \\ \quad \llbracket MissionSync \rrbracket \\ \left(\begin{array}{l} ManagedThreadFW(MT1ID) \\ \quad \llbracket SchedulablesSync \rrbracket \\ ManagedThreadFW(MT2ID) \\ \quad \llbracket SchedulablesSync \rrbracket \\ ManagedThreadFW(MT3ID) \end{array}\right) \end{array}\right) \end{array}$$

$$\begin{array}{l} \mathbf{process}\ Framework \mathrel{\widehat=} \\ \left(\begin{array}{l} ControlTier \\ \quad \llbracket TierSync \rrbracket \\ (Tier0) \end{array}\right) \end{array}$$

$$\begin{array}{l} \mathbf{process}\ Application \mathrel{\widehat=} \\ \left(\begin{array}{l} MyAppApp \\ ||| \\ mainSequencerApp \\ ||| \\ MissionAApp \\ ||| \\ MT1App \\ ||| \\ MT2App \\ ||| \\ MT3App \end{array}\right) \end{array}$$

$$\mathbf{process}\ Program \mathrel{\widehat=} \left(Framework \llbracket AppSync \rrbracket Application\right) \llbracket LockingSync \rrbracket Locking$$

3 Safelet

section $MyAppApp$ **parents** $scj\_prelude, SchedulableId, SchedulableIds, SafeletChan, MethodCallBindingChannels$

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

$$InitializeApplication \mathrel{\widehat=} \left(\begin{array}{l} initializeApplicationCall \longrightarrow \\ initializeApplicationRet \longrightarrow \\ \mathbf{Skip} \end{array}\right)$$

$$GetSequencer \mathrel{\widehat=} \left(\begin{array}{l} getSequencerCall \longrightarrow \\ getSequencerRet \,!\, mainSequencerSID \longrightarrow \\ \mathbf{Skip} \end{array}\right)$$

$$Methods \mathrel{\widehat=} \left(\begin{array}{l} GetSequencer \\ \Box \\ InitializeApplication \end{array}\right) ; \ Methods$$

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

end

4 Top Level Mission Sequencer

$\mathbf{section}\ mainSequencerApp\ \mathbf{parents}\ TopLevelMissionSequencerChan,$
$\quad MissionId, MissionIds, SchedulableId, SchedulableIds, mainSequencerClass, MethodCallBindingChannels$

$\mathbf{process}\ mainSequencerApp \mathrel{\widehat=}$
$\quad name : String \bullet \mathbf{begin}$

$$\begin{array}{|l}
\multicolumn{1}{l}{\underline{\ State\ }}\\
this : \mathbf{ref}\ mainSequencerClass\\
\hline
\end{array}$$

$\mathbf{state}\ State$

$$\begin{array}{|l}
\multicolumn{1}{l}{\underline{\ Init\ }}\\
State'\\
\hline
this' = \mathbf{new}\ mainSequencerClass()\\
\hline
\end{array}$$

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

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

$$\bullet\ (Init\ ;\ Methods) \mathbin{\triangle} (end\_sequencer\_app\,.\,mainSequencerSID \longrightarrow \mathbf{Skip})$$

$\mathbf{end}$

$\mathbf{section}\ mainSequencerClass\ \mathbf{parents}\ scj\_prelude, SchedulableId, SchedulableIds, SafeletChan$
$, MethodCallBindingChannels, MissionId, MissionIds$

$\mathbf{class}\ mainSequencerClass \mathrel{\widehat=} \mathbf{begin}$

$$\begin{array}{|l}
\mathbf{state}\ State \\
\hline
notReleased : \mathbb{B} \\
\hline
\end{array}$$

$\mathbf{state}\ State$

$$\begin{array}{|l}
\mathbf{initial}\ Init \\
\hline
State' \\
\hline
notReleased = \mathbf{True} \\
\hline
\end{array}$$

$$\mathbf{protected}\ getNextMission \mathrel{\widehat=} \mathbf{var}\ ret : MissionID \bullet$$
$$\left(\begin{array}{l}
\mathbf{if}\ notReleased = \mathbf{True} \longrightarrow \\
\qquad \left(\begin{array}{l}
\mathbf{var}\ mission : MissionID \bullet mission := MissionAMID; \\
notReleased := \mathbf{False}; \\
ret := mission
\end{array}\right) \\
\mathrel{[]} \neg\ notReleased = \mathbf{True} \longrightarrow \\
\qquad \left(ret := nullMissionId\right) \\
\mathbf{fi}
\end{array}\right)$$

$\bullet\ \mathbf{Skip}$

end

5 Missions

5.1 MissionA

$$\begin{array}{l}\mathbf{section}\ MissionAApp\ \mathbf{parents}\ scj\_prelude, MissionId, MissionIds, \\ \quad SchedulableId, SchedulableIds, MissionChan, SchedulableMethChan, MissionAMethChan \\ , MethodCallBindingChannels\end{array}$$

$$\begin{array}{l}InitializePhase \mathrel{\widehat=} \\ \left(\begin{array}{l}initializeCall\,.\,MissionAMID \longrightarrow \\ register\,!\,MT1SID\,!\,MissionAMID \longrightarrow \\ register\,!\,MT2SID\,!\,MissionAMID \longrightarrow \\ register\,!\,MT3SID\,!\,MissionAMID \longrightarrow \\ initializeRet\,.\,MissionAMID \longrightarrow \\ \mathbf{Skip}\end{array}\right)\end{array}$$

$$\begin{array}{l}CleanupPhase \mathrel{\widehat=} \\ \left(\begin{array}{l}\mathbf{var}\,\mathbb{B} : ret \bullet cleanupMissionCall\,.\,MissionAMID \longrightarrow \\ cleanupMissionRet\,.\,MissionAMID\,!\,\mathbf{True} \longrightarrow \\ \mathbf{Skip}\end{array}\right)\end{array}$$

$$Methods \mathrel{\widehat=} \left(\begin{array}{l}InitializePhase \\ \Box \\ CleanupPhase\end{array}\right) ; \ Methods$$

$$\bullet\ (Init\ ; \ Methods) \bigtriangleup (end\_mission\_app\,.\,MissionAMID \longrightarrow \mathbf{Skip})$$

end

5.2 Schedulables of MissionA

section $MT1App$ **parents** $ManagedThreadChan, SchedulableId, SchedulableIds, MethodCallBindingChannels$

process $MT1App \mathrel{\widehat=}$ **begin**

$$Run \mathrel{\widehat=} \left(\begin{array}{l} runCall\,.\,MT1SID \longrightarrow \\ \mathbf{Skip}; \\ runRet\,.\,MT1SID \longrightarrow \\ \mathbf{Skip} \end{array}\right)$$

$$Methods \mathrel{\widehat=} \left(Run\right)\ ;\ Methods$$

$$\bullet\ (Methods) \bigtriangleup (end\_managedThread\_app\,.\,MT1SID \longrightarrow \mathbf{Skip})$$

end

section $MT2App$ **parents** $ManagedThreadChan, SchedulableId, SchedulableIds, MethodCallBindingChannels$

process $MT2App \mathrel{\widehat=}$ **begin**

$$Run \mathrel{\widehat=} \left(\begin{array}{l} runCall \,.\, MT2SID \longrightarrow \\ \textbf{Skip}; \\ runRet \,.\, MT2SID \longrightarrow \\ \textbf{Skip} \end{array}\right)$$

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

$$\bullet\ (Methods) \mathbin{\triangle} (end\_managedThread\_app \,.\, MT2SID \longrightarrow \textbf{Skip})$$

end

section *MT3App* **parents** *ManagedThreadChan*, *SchedulableId*, *SchedulableIds*, *MethodCallBindingChannels*

process *MT3App* $\widehat{=}$ **begin**

$$Run \mathrel{\widehat{=}} \left(\begin{array}{l} runCall\,.\,MT3SID \longrightarrow \\ \mathbf{Skip}; \\ runRet\,.\,MT3SID \longrightarrow \\ \mathbf{Skip} \end{array}\right)$$

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

$$\bullet\ (Methods) \bigtriangleup (end\_managedThread\_app\,.\,MT3SID \longrightarrow \mathbf{Skip})$$

end