

Circus-L^AT_EX style explained

Community Z Tools (CZT)

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* PARSER DOES NOT YET SUPPORT LOGICAL CONSTANTS

A Reference card

A.1 Special *Circus* symbols

Refinement

$n \Vdash S = I$	$n \text{ \texttt{\textbackslash circassertref } } S = I$
$n \Vdash S \preceq I$	$n \text{ \texttt{\textbackslash circassertref } } S \text{ \texttt{\textbackslash circsimulates } } I$
$n \Vdash S \sqsubseteq I$	$n \text{ \texttt{\textbackslash circassertref } } S \text{ \texttt{\textbackslash circrefines } } I$
$n \Vdash S \sqsubseteq Tr\ I$	$n \text{ \texttt{\textbackslash circassertref } } S \text{ \texttt{\textbackslash circrefines } } Tr\ I$
$n \Vdash S \sqsubseteq SFl\ I$	$n \text{ \texttt{\textbackslash circassertref } } S \text{ \texttt{\textbackslash circrefines } } SFl\ I$
$n \Vdash S \sqsubseteq FLDv\ I$	$n \text{ \texttt{\textbackslash circassertref } } S \text{ \texttt{\textbackslash circrefines } } FLDv\ I$

A.2 *Circus* channels and name sets

<u><i>channel</i></u> e	$\text{\texttt{\textbackslash circchannel } } e$
<u><i>channel</i></u> $c : T$	$\text{\texttt{\textbackslash circchannel } } c : T$
<u><i>channel</i></u> $[X]c : X$	$\text{\texttt{\textbackslash circchannel } } [X] c : X$
<u><i>channelfrom</i></u> S	$\text{\texttt{\textbackslash circchannelfrom } } S$
<u><i>channelfrom</i></u> $[X]S[X]$	$\text{\texttt{\textbackslash circchannelfrom } } [X] S[X]$
<u><i>channelset</i></u> $n == \{ c \}$	$\text{\texttt{\textbackslash circchannelset } } n == \text{\texttt{\textbackslash lchanset } } c \text{ \texttt{\textbackslash rchanset } }$
<u><i>channelset</i></u> $n == CSRef$	$\text{\texttt{\textbackslash circchannelset } } n == CS$
<u><i>channelset</i></u> $[X]n == CSRef$	$\text{\texttt{\textbackslash circchannelset } } [X] n == CS$
<u><i>nameset</i></u> $n == \{ x \}$	$\text{\texttt{\textbackslash circnameset } } n == \{ \sim x \sim \}$
<u><i>nameset</i></u> $n == NSRef$	$\text{\texttt{\textbackslash circnameset } } n == NS$

A.3 *Circus* actions

Action definition

$n \hat{=} A$	$n \text{ \texttt{\textbackslash circdef } } A$
$n \hat{=} x : T \bullet A$	$n \text{ \texttt{\textbackslash circdef } } x : T \text{ \texttt{\textbackslash circspot } } A$

Basic actions

<u><i>Skip</i></u>	$\text{\texttt{\textbackslash Skip}}$
<u><i>Stop</i></u>	$\text{\texttt{\textbackslash Stop}}$
<u><i>Chaos</i></u>	$\text{\texttt{\textbackslash Chaos}}$

Prefixing action

$e \longrightarrow A$	$e \text{ \texttt{\textbackslash then } } A$
$c.0 \longrightarrow A$	$c.0 \text{ \texttt{\textbackslash then } } A$
$c!v \longrightarrow A$	$c!v \text{ \texttt{\textbackslash then } } A$
$c?x \longrightarrow A$	$c?x \text{ \texttt{\textbackslash then } } A$
$c?x!y?z \longrightarrow A$	$c?x!y?z \text{ \texttt{\textbackslash then } } A$

Prefixing action (extra)

$c?x : (P)!(f\ x) \longrightarrow A$
 $c?x \ \backslash\text{prefixcolon} \ (P)!(f\sim x) \ \backslash\text{then} \ A$
 $c?x : (x > 1)!(f\ x) \longrightarrow A$
 $c?x \ \backslash\text{prefixcolon} \ (x > 1)!(f\sim x) \ \backslash\text{then} \ A$
 $c[\mathbb{N} \times \mathbb{P}\ \mathbb{N}]?x!(\text{dom}\ R) \longrightarrow A$
 $c[\backslash\text{nat} \ \backslash\text{cross} \ \backslash\text{power}\sim\backslash\text{nat}]?x!(\backslash\text{dom}\sim R) \ \backslash\text{then} \ A$

Unary actions

(S) $\backslash\text{lschexpract} \ S \ \backslash\text{rschexpract}$
 $\mu X \bullet A$ $\backslash\text{circmu} \ X \ \backslash\text{circspot} \ A$
 $A \setminus CS$ $A \ \backslash\text{circhide} \ CS$
 $(P) \& A$ $\backslash\text{lcircguard} \ P \ \backslash\text{rcircguard} \ \backslash\text{circguard} \ A$

Binary actions

$A \parallel NSa \mid NSb \parallel B$ $A \ \backslash\text{linter} \ NSa \mid NSb \ \backslash\text{rinter} \ B$
 $A \parallel B$ $A \ \backslash\text{interleave} \ B$
 $A \parallel NSa \mid CS \mid NSb \parallel B$ $A \ \backslash\text{lpar} \ NSa \mid CS \mid NSb \ \backslash\text{rpar} \ B$
 $A \parallel CS \parallel B$ $A \ \backslash\text{lpar} \ CS \ \backslash\text{rpar} \ B$
 $A[NSb \mid CSa \mid CSb \mid NSb]B$ $A \ [\ NSb \mid CSa \mid CSb \mid NSb \] \ B$
 $A[CSa \mid CSb]B$ $A \ [\ CSa \mid CSb \] \ B$
 $A \sqcap B$ $A \ \backslash\text{intchoice} \ B$
 $A \square B$ $A \ \backslash\text{extchoice} \ B$
 $A ; B$ $A \ \backslash\text{circseq} \ B$
 $AName$ $AName$
 $AName(x, y)$ $AName(x, \ y)$
 $AName[new/old, x/y]$ $AName[new/old, \ x/y]$

Replicated actions

$\parallel x : T \bullet A$ $\backslash\text{Interleave} \ x : T \ \backslash\text{circspot} \ A$
 $\parallel x : T \parallel NS \bullet A$ $\backslash\text{Interleave} \ x : T \ \backslash\text{linter} \ NS \ \backslash\text{rinter} \ \backslash\text{circspot} \ A$
 $\parallel CS \parallel x : T \bullet NS \parallel A$ $\backslash\text{lpar} \ CS \ \backslash\text{rpar} \ x : T \ \backslash\text{circspot} \ \backslash\text{lpar} \ NS \ \backslash\text{rpar} \ A$
 $\parallel CS \parallel x : T \bullet A$ $\backslash\text{lpar} \ CS \ \backslash\text{rpar} \ x : T \ \backslash\text{circspot} \ A$
 $\sqcap x : T \bullet A$ $\backslash\text{Intchoice} \ x : T \ \backslash\text{circspot} \ A$

$\Box x : T \bullet A$	<code>\Extchoice x : T \circspot A</code>
$\dot{;} x : T \bullet A$	<code>\Semi x : T \circspot A</code>

Parentthesised actions

(A)	<code>(A)</code>
$(x : T \bullet A)$	<code>(x : T \circspot A)</code>
$(\underline{\mathbf{val}} x : T \bullet A)$	<code>(\circval x : T \circspot A)</code>
$(\underline{\mathbf{res}} x : T \bullet A)$	<code>(\circres x : T \circspot A)</code>
$(\underline{\mathbf{vres}} x : T \bullet A)$	<code>(\circvres x : T \circspot A)</code>
$(x : T \bullet A)(v)$	<code>(x : T \circspot A)(v)</code>
$(\underline{\mathbf{val}} x : T \bullet A)(v)$	<code>(\circval x : T \circspot A)(v)</code>
$(\underline{\mathbf{res}} x : T \bullet A)(v)$	<code>(\circres x : T \circspot A)(v)</code>
$(\underline{\mathbf{vres}} x : T \bullet A)(v)$	<code>(\circvres x : T \circspot A)(v)</code>
$(\mu X \bullet x : T \bullet A)(v)$	<code>(\circmu X \circspot x : T \circspot A)(v)</code>
$(\mu X \bullet (x : T \bullet A))(v)$	<code>(\circmu X \circspot (x : T \circspot A))(v)</code>
$(\mu X \bullet \underline{\mathbf{val}} x : T \bullet A)(v)$	<code>(\circmu X \circspot \circval x : T \circspot A)(v)</code>
$(\mu X \bullet \underline{\mathbf{res}} x : T \bullet A)(v)$	<code>(\circmu X \circspot \circres x : T \circspot A)(v)</code>
$(\mu X \bullet \underline{\mathbf{vres}} x : T \bullet A)(v)$	<code>(\circmu X \circspot \circvres x : T \circspot A)(v)</code>

A.4 Circus command definitions

Guarded commands

$x, y := v1, v2$	<code>x, y := v1, v2</code>
$x, y : [P, Q]$	<code>x, y \prefixcolon [~ P, Q ~]</code>
$: [P, Q]$	<code>\prefixcolon [~ P, Q ~]</code>
$\{P\}$	<code>\{~ P ~\}</code>
$[P]$	<code>[~ P ~]</code>
$\underline{\mathbf{if}} P \longrightarrow A \parallel B \underline{\mathbf{fi}}$	<code>\circif P \circrthen A \circrclse B \circrffi</code>
$\underline{\mathbf{do}} P \longrightarrow A \underline{\mathbf{od}}$	<code>\circdo P \circrthen A \circrcod</code>
$\underline{\mathbf{con}} X \bullet A$	<code>\circcon X \circspot A</code>
$\underline{\mathbf{var}} x : T \bullet A$	<code>\circvar x : T \circspot A</code>

Parameterised commands

$\underline{\mathbf{val}} x : T \bullet A$	<code>\circval x : T \circspot A</code>
$\underline{\mathbf{res}} x : T \bullet A$	<code>\circres x : T \circspot A</code>

$\underline{vres} x : T \bullet A$ $\backslash\text{circvres } x : T \backslash\text{circspot } A$

A.5 Circus processes

Process definition

$\underline{process} n \hat{=} PD$ $\backslash\text{circprocess } n \backslash\text{circdef } PD$
 $\underline{process}[X]n \hat{=} PD$ $\backslash\text{circprocess } [X] n \backslash\text{circdef } PD$

Basic process

$\underline{process} n \hat{=} \underline{begin} \dots BP \dots \underline{end}$
 $\backslash\text{circprocess } n \backslash\text{circdef } \backslash\text{circbegin } \backslash\text{ldots } BP \backslash\text{ldots } \backslash\text{circend}$
 $\underline{state} n == S$ $\backslash\text{circstate } n == S$
 $\underline{state} S$ $\backslash\text{circstate } S$

Unary processes

$P \setminus CS$ $P \backslash\text{circhide } CS$
 $PName$ $PName$
 $PName[\mathbb{N}]$ $PName[\backslash\text{nat}]$
 $PName(x, y)$ $PName(x, y)$
 $PName[\mathbb{N}](x, y)$ $PName[\backslash\text{nat}](x, y)$
 $PName[x]$ $PName \backslash\text{lcircindex } x \backslash\text{rcircindex}$
 $PName[\mathbb{N}][x]$ $PName[\backslash\text{nat}] \backslash\text{lcircindex } x \backslash\text{rcircindex}$
 $PName[c, d := e, f]$ $PName \backslash\text{lcircrename } c, d := e, f \backslash\text{rcircrename}$
 $PName[\mathbb{N}][c, d := e, f]$ $PName[\backslash\text{nat}] \backslash\text{lcircrename } c, d := e, f \backslash\text{rcircrename}$

Binary processes

$P \parallel Q$ $P \backslash\text{interleave } Q$
 $P \parallel CS \parallel Q$ $P \backslash\text{lpar } CS \backslash\text{rpar } Q$
 $P \sqcap Q$ $P \backslash\text{intchoice } Q$
 $P \sqcup Q$ $P \backslash\text{extchoice } Q$
 $P ; Q$ $P \backslash\text{circseq } Q$

Parameterised and indexed processes

$x : T \bullet P$ $x : T \backslash\text{circspot } P$
 $x : T \odot P$ $x : T \backslash\text{circindex } P$

Parenthesised processes

(P)	<code>(P)</code>
$(x : T \bullet P)$	<code>(x : T \circ\circ\circspot P)</code>
$(x : T \odot P)$	<code>(x : T \circ\circ\circindex P)</code>
$(P)[c := d]$	<code>(P) \circ\circ\circrename c := d \circ\circ\circrename</code>
$(x : T \bullet P)[c := d]$	<code>(x : T \circ\circ\circspot P) \circ\circ\circrename c := d \circ\circ\circrename</code>
$(x : T \odot P)[c := d]$	<code>(x : T \circ\circ\circindex P) \circ\circ\circrename c := d \circ\circ\circrename</code>
$(x : T \bullet P)(v)$	<code>(x : T \circ\circ\circspot P)(v)</code>
$(x : T \odot P)(v)$	<code>(x : T \circ\circ\circindex P)(v)</code>
$[X](x : X \bullet P)[\mathbb{N}](1)$	<code>[X](x : X \circ\circ\circspot P) [\circ\circ\circnat] (1)</code>
$[X](x : X \odot P)[\mathbb{N}](1)$	<code>[X](x : X \circ\circ\circindex P) [\circ\circ\circnat] (1)</code>
$(\mu X \bullet x : T \bullet P)(v)$	<code>(\circ\circ\circmu X \circ\circ\circspot x : T \circ\circ\circspot P)(v)</code>
$(\mu X \bullet (x : T \bullet P))(v)$	<code>(\circ\circ\circmu X \circ\circ\circspot (x : T \circ\circ\circspot P))(v)</code>
$(\mu X \bullet \underline{\text{val}} x : T \bullet P)(v)$	<code>(\circ\circ\circmu X \circ\circ\circspot \circ\circ\circval x : T \circ\circ\circspot P)(v)</code>

Replicated processes

$\parallel x : T \bullet P$	<code>\Interleave x: T \circ\circ\circspot P</code>
$\parallel x : T \parallel CS \bullet P$	<code>\Parallel x: T \circ\circ\circ lpar CS \circ\circ\circ rpar \circ\circ\circspot P</code>
$\sqcap x : T \bullet P$	<code>\Intchoice x : T \circ\circ\circspot P</code>
$\square x : T \bullet P$	<code>\Extchoice x : T \circ\circ\circspot P</code>
$\dot{;} x : T \bullet P$	<code>\Semi x : T \circ\circ\circspot P</code>

A.6 Mathematical toolkits

Circus prelude

\mathbb{B}	<code>\boolean</code>
\mathbb{U}	<code>\universe</code>
$\underline{\text{True}}$	<code>\true</code>
$\underline{\text{False}}$	<code>\false</code>

Circus model checking toolkit

$SS \dot{\cap} TT$	<code>SS \gendj TT</code>
$\otimes SS$	<code>\regions SS</code>
$SS \setminus S$	<code>SS \dsetminus S</code>
$SS \diamond S$	<code>SS \dcap S</code>

References