



This is a chapter from the book

System Design, Modeling, and Simulation using Ptolemy II

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Actor Index

A small fraction of the actors in the standard Ptolemy II library are described in detail in this book. Below is a summary of all the actors in the library.

Sources Library		
Const	produce a constant sequence	48
CurrentMicrostep	produce the current microstep when fired	242
CurrentTime	produce the current model time when fired	242
DiscreteClock	produce a timed sequence	241
InteractiveShell	shell for interaction with a user	136
Interpolator	produce a signal by interpolating given values	48
Pulse	produce a sequence pattern	48
Ramp	produce a counting sequence	48
Sequence	produce a sequence of specified values	48
SketchedSource	produce a sketched signal	48
StringConst	produce a constant string-valued sequence	48
Subscriber	output tokens published by a Publisher	48
SubscriptionAggregator	output tokens published by a Publisher	48
PoissonClock	produce a random timed sequence	241
TriggeredSinewave	produce samples of a sine wave	48
Sinewave	produce a sine wave	48

Sinks Library		
ArrayPlotter	plot an input array	601
ArrayPlotterXY	plot an array input as an X-Y plot	601
BarGraph	create a bar graph	601
Discard	discard the input	49
Display	display the input value in a window	49
HistogramPlotter	create a histogram	601
MonitorValue	display the input value in the icon	248
Publisher	send inputs to Subscribers	49
Recorder	record inputs	49
SequencePlotter	Plot an input sequence	600
SequenceScope	Plot an input sequence	601
SetVariable	set a variable equal the value of the input	49
TimedPlotter	plot an input sequence vs. time	601
TimedScope	plot an input sequence vs. time	601
XYPlotter	plot an input sequence as an X-Y plot	601
XYScope	plot an input sequence as an X-Y plot	601

Array Library		
ArrayAccumulate	accumulate input arrays into one array	88
ArrayAppend	append input arrays into one array	88
ArrayAverage	average the elements of an array	88
ArrayContains	determine whether an array contains an element	88
ArrayElement	extract an element of an array	88
ArrayElementAsMatrix	extract an element of an array	88
ArrayExtract	extract a subarray	88
ArrayLength	output the length of an array	88
ArrayLevelCrossing	search a subarray for a level crossing	88
ArrayMaximum	find the maximum value in an array	88
ArrayMinimum	find the minimum value in an array	88
ArrayPeakSearch	search an array for peaks	88
ArrayRemoveElement	remove the specified element from an array	88
ArraySort	sort an array	88
ArraySum	sum elements of an array	88
ArrayToElements	break an array into elements	86
ArrayToSequence	output the array elements in sequence	86
ArrayUpdate	change an element of an array	88
ElementsToArray	construct an array from elements	86
SequenceToArray	convert a sequence into an array	86

Conversions		
AnythingToDouble	cast to double (with NaN for non-doubles)	—
BooleanToAnything	convert a boolean to two arbitrary values	169
BitsToInt	convert a sequence of bits to an integer	—
CartesianToComplex	convert two doubles to complex	—
CartesianToPolar	convert cartesian to magnitude and phase	—
ComplexToCartesian	convert complex to two doubles	—
ComplexToPolar	convert complex to magnitude and phase	—
DoubleToFix	convert a double to a fixed-point number	—
ExpressionToToken	parse and evaluate a string expression	253
FixToDouble	convert a fixed-point number to a double	—
FixToFix	convert a fixed-point number to another	—
IntToBits	convert an integer to a sequence of bits	—
InUnitsOf	reinterpret a value in new units	—
LongToDouble	coerce a long into a double	—
PolarToCartesian	convert magnitude and phase to cartesian	—
Round	convert a double to an int	—
StringToUnsignedByteArray	convert a string to an array of bytes	86
StringToXML	parse an XML-formatted string	—
TokenToExpression	produce a string representation of a token	634
UnsignedByteArrayToString	convert a byte array to a string	86

Flow Control		
BooleanMultiplexor	multiplexor with two inputs	119
BooleanSelect	Select with two inputs	119
BooleanSwitch	Switch with two outputs	119
BusAssembler	aggregate signals into a bus	65
BusDisassembler	disaggregate signals from a bus	65
Chop	break a sequence into chunks	106
Commutator	interleave streams in round robin	106
ConfigurationSelect	select inputs based on a parameter	119
ConfigurationSwitch	switch signals based on a parameter	119
CountTrues	output the number of trues received	—
Distributor	divide a stream in round robin	106
Exit	stop the current Ptolemy process and exit	—
Multiplexor	build a stream with elements from streams	119
OrderedRecordAssembler	construct an ordered record	253
RecordAssembler	construct a record	253
RecordDisassembler	extract fields from a record	253
RecordUpdater	update fields in a record	253

Flow Control		
Repeat	repeat an input token	106
Sampler	sample a signal	244
SampleDelay	output initial tokens	103
Select	interleave streams	119
Sequencer	sequence tokens by sequence number	143
SingleTokenCommutator	commutator that outputs one token at a time	110
Stop	stop a model execution	143
Switch	split streams	119
Synchronizer	synchronize a set of streams	143
ThrowException	throw an exception	—
ThrowModelError	throw a model error	—
UnionDisassembler	extract a particular type from a union	471
UnionMerge	merge types into a union	471
VectorAssembler	construct a column or row matrix	—
VectorDisassembler	deconstruct a column or row matrix	—

Higher Order Actors		
ApplyFunction	apply a function to the inputs	89
Case	apply one of n models to the inputs	120
IterateOverArray	apply a model to each element of an input array	84
MobileModel	apply a model provided as an input	89
ModelDisplay	display a model	—
ModelReference	execute a model defined in another file	87
MultiInstanceComposite	execute copies of a model on inputs	81
RunCompositeActor	execute a submodel to completion	87
PtalonActor	construct a model using Ptalon	—
ThreadedComposite	execute a model in a new thread	258
VisualModelReference	execute a model defined in another file	87

IO Actors		
ArrowKeySensor	report keystrokes on the arrow keys	128
CSVReader	read comma-separated values	128
CSVWriter	write comma-separated values	128
DatagramReader	read packets from the network	—
DatagramWriter	write packets to a network	—
DirectoryListing	list files in a directory keys	128
FileReader	read a file or URL	128
FileWriter	write a file	128

IO Actors		
LineReader	read lines from a file or URL	128
LineWriter	write lines to a file	128

Logic Actors		
Comparator	compare two values	112
Equals	compare n inputs for equality	112
IsPresent	determine whether a value is present	167
LogicalNot	negate a boolean	112
LogicGate	evaluate a logic function of two inputs	112
TrueGate	filter for true-valued booleans	167

Math Library		
AbsoluteValue	absolute value	57
AddSubtract	add and subtract inputs	57
Accumulator	accumulate input values	57
Average	average input values	57
Counter	count up and down	57
Differential	difference of current and previous value	57
DotProduct	dot product of array inputs	57
Limiter	limit values to a range	57
LookupTable	look up values in a table	57
Maximum	maximum of a set of inputs	58
Minimum	minimum of a set of inputs	58
MovingAverage	average of n recent inputs	58
MultiplyDivide	multiply and divide inputs	58
Quantizer	quantize the input	58
Remainder	output the remainder	58
RunningMaximum	maximum of n recent inputs	58
RunningMinimum	minimum of n recent inputs	58
Scale	multiply by a constant	58
TrigFunction	trigonometric functions	58
UnaryMathFunction	exponential, log, etc.	58

Matrix Actors		
ArrayToMatrix	convert an array to a matrix	86
MatrixJoin	join matrices by tiling	—

Matrix Actors		
MatrixSplit	split a matrix by tiles	—
MatrixToArray	convert a matrix to an array	86
MatrixToSequence	convert a matrix to a sequence of elements	—
MatrixViewer	display a matrix	—
SequenceToMatrix	convert a sequence to a matrix	—
SubMatrix	extract a submatrix	—

Random Number Generators		
Bernoulli	random true or false	114
ColtBeta	Beta random number	—
ColtBinomial	Binomial random number	—
ColtBinomialSelector	Binomial selection random number	—
ColtBreitWigner	Breit-Wigner random number	—
ColtChiSquare	Chi-squared random number	—
ColtExponential	exponential random number	248
ColtExponentialPower	exponential power random number	—
ColtGamma	gamma random number	—
ColtHyperGeometric	hyper-geometric random number	—
ColtLogarithmic	logarithmic random number	—
ColtNegativeBinomial	negative binomial random number	—
ColtNormal	normal random number	—
ColtPoisson	Poisson random number	—
ColtPoissonSlow	Poisson slow random number	—
ColtStudentT	student T random number	—
ColtVonMises	VonMises random number	—
ColtZeta	zeta random number	—
DiscreteRandomSource	discrete random number	—
Gaussian	Gaussian random number	62
RandomInteger	random 32-bit integer	—
Rician	Rician random number	—
Triangular	random number with a triangular distribution	—
Uniform	random number with a uniform distribution	147

Real-Time Actors		
DelayStart	delay start of execution of a model	—
ExecutionTime	simulate execution time	—
RealTimePlotter	plot a signal vs. real time	602
Sleep	sleep the calling thread	147

Real-Time Actors		
VariableSleep	sleep the calling thread	—
WallClockTime	output the current time of day	242

Signal Processing		
AudioCapture	capture audio from a microphone	98
AudioReader	output sampled audio from a file	—
AudioPlayer	play input audio samples	—
AudioWriter	write audio samples to an audio file	—
Autocorrelation	estimate the autocorrelation of the input	—
ClipPlayer	play an audio clip on each firing	—
ComputeHistogram	compute a histogram	601
ConvolutionalCoder	encode a binary sequence	—
DB	convert values to decibels	—
DelayLine	output arrays with a sliding window	107
DeScrambler	unrandomize a binary sequence	—
DownSample	downsample a signal	106
FFT	fast Fourier transform	101
FIR	finite impulse response filter	107
GradientAdaptiveLattice	gradient adaptive lattice filter	—
HadamardCode	produce a Hadamard code	—
HammingCoder	encode a binary sequence	—
HammingDecoder	decode a binary sequence	—
HuffmanCoder	encode a sequence with a Huffman code	—
HuffmanDecoder	decode a sequence with a Huffman code	—
IFFT	inverse fast Fourier transform	101
IIR	infinite impulse response filter	107
Lattice	FIR filter with a lattice structure	—
LempelZivCoder	encode a sequence with Lempel Ziv	—
LempelZivDecoder	decode a sequence with Lempel Ziv	—
LevinsonDurbin	Levinson-Durbin spectral estimation	—
LinearDifferenceEquationSystem	linear difference equation filter	—
LineCoder	binary sequence to symbol sequence	—
LMSAdaptive	least mean square adaptive filter	107
MaximumEntropySpectrum	maximum entropy spectral estimation	101
PhaseUnwrap	phase unwrap algorithm	—
PowerEstimate	estimate the power of the input	—
RaisedCosine	raised cosine frequency response filter	—
RecursiveLattice	IIR filter with a lattice structure	—
Scrambler	randomize a binary sequence	—

Signal Processing		
SmoothedPeriodogram	smoothed periodogram spectrum	101
Spectrum	discrete Fourier transform spectrum	101
TrellisDecoder	decode a trellis code	—
UpSample	upsample a sequence	106
VariableFIR	FIR filter with time-varying taps	107
VariableLattice	lattice filter, time-varying taps	—
VariableRecursiveLattice	recursive lattice filter, time-varying taps	—
ViterbiDecoder	decode with a Viterbi decoder	—

String Library		
StringCompare	compare two strings	125
StringFunction	trim or convert case of a string	125
StringIndexOf	find a string within another	125
StringLength	output the length of a string	125
StringMatches	compare a string against a pattern	125
StringReplace	replace a substring	125
StringSplit	split a string into pieces	125
StringSubstring	extract a substring	125

Domain Specific - Continuous		
BandlimitedNoise	bandlimited noise	326
ContinuousClock	continuous clock	326
ContinuousSinewave	continuous sine wave	326
ContinuousSpectrum	spectrum of a continuous signal	—
ContinuousTransferFunction	linear continuous filter	320
Derivative	approximate derivative	327
DifferentialSystem	nonlinear continuous system	327
DiscreteClock	discrete clock	241
Integrator	continuous integrator	316
LevelCrossingDetector	detect a level crossing	341
LinearStateSpace	linear continuous filter	327
Noise	continuous noise	—
PeriodicSampler	sample at a regular rate	341
ResettableTimer	resettable timer	241
Sampler	sample on demand	244
SingleEvent	single event	241
Waveform	continuous waveform	326
ZeroOrderHold	discrete to continuous converter	338

DomainSpecific - Discrete Event		
AverageOverTime	average taking into account time	—
Derivative	approximate derivative	327
EventFilter	filter true-valued events	244
Inhibit	conditionally block events	244
Integrator	discrete approximation to an integral	—
Merge	merge streams of events in temporal order	244
MicrostepDelay	delay by one microstep	243
MostRecent	trigger the most recently received value	244
PID	proportional, integral, derivative controller	—
Previous	output the previous event	243
Queue	queue	246
Register	latch values and produce on demand	244
ResettableTimer	resettable timer	241
Server	queue and server	246
SharedQueue	shared queue	246
SingleEvent	output a single event	241
TimeCompare	compare times of two events	242
TimeGap	output time between events on a stream	242
WaitingTime	output the time one event waits for another	242

DomainSpecific - Process Networks		
NondeterministicMerge	nondeterministically merge streams	143
OrderedMerge	merge two numerically increasing streams	143
Starver	pass a finite number of tokens	143

DomainSpecific - Rendezvous		
Barrier	barrier synchronization	146
Buffer	buffer for communication	146
Merge	merge	244
ResourcePool	pool of resources	146

DomainSpecific - Synchronous Reactive		
Absent	assert absent output	167
Current	output most recent non-absent input	167
Default	merge two streams with priority	167
EnabledComposite	composite with conditional firing	175

DomainSpecific - Synchronous Reactive		
InstantaneousDialogGenerator	test for instantaneous dialogs	—
IsPresent	true output on present input	167
NonStrictDelay	one-tick delay	167
NonStrictDisplay	display that shows absent inputs	203
NonStrictLogicGate	parallel or and and	169
NonStrictThreeBitAdder	test actor	—
When	gate a signal with another	167
TrueGate	gate a signal	167

Although they are not part of the Ptolemy II standard library, the Ptolemy distribution includes a collection of useful actors in the `MoreLibraries` library. The table below highlights a few of these.

More Libraries		
ArrayOfRecordsRecorder	display an array of records	—
CallInterpreter	actor defined in the Cal actor language	—
DatabaseInsert	database insert via a <code>DatabaseManager</code>	—
DatabaseManager	interface to a database	—
DatabaseQuery	perform a query via a <code>DatabaseManager</code>	—
DatabaseSelect	perform a select via a <code>DatabaseManager</code>	—
Exec	execute a command-line statement	—
HttpActor	react to HTTP requests via a WebServer actor	584
JSONToToken	convert a JSON string to a record	—
KeyWriter	write a key out to a key store	—
SQLStatement	issue an SQL statement via a <code>DatabaseManager</code>	—
FSMActor	finite state machine without hierarchy	188
MatlabExpression	compute an output using a MATLAB script	437
NonStrictTest	test inputs against expected values	126
PrivateKeyReader	produce a private key from a key store	—
PublicKeyReader	produce a public key from a key store	—
PythonActor	actor specified in the Python language	437
PythonScript	actor specified in the Python language	437
SecretKey	create a secret key	—
SecretKeyReader	produce a secret key from a key store	—
SendMail	send email	—
SerialComm	read from or write to a serial port	—
SignatureSigner	sign data using a private key	—
SignatureVerifier	verify signed data	—
Simulator	run a program with socket communication	—

More Libraries		
StringToXML	convert XML-formatted string to an XML token	634
SymmetricDecryption	decrypt data	—
SymmetricEncryption	encrypt data	—
SystemCommand	invoke an external program and report results	—
Test	test inputs against expected values	126
TestExceptionAttribute	check exceptions against an expected exception	126
TokenToJSON	convert a record to a JSON string	—
WebServer	start a web server on the local machine	584
XMLInclusion	combine XML tokens into one	—
XSLTransformer	transform XML using XSLT	—