# cefasRL

## Design Description

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# cefasRL: Design Description

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# Chapter 1. Model Version

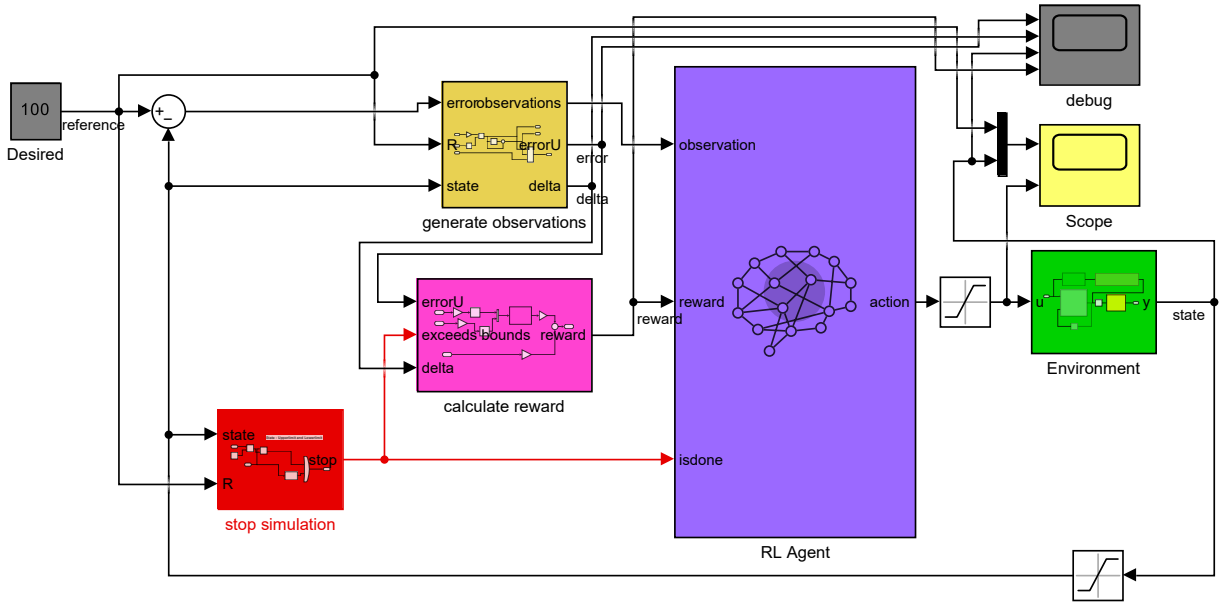
**Version:** 7.13

**Last modified:** Mon Oct 16 16:03:58 2023

**Checksum:** 2539353432 277888565 214452075 2417178157

# Chapter 2. Root System

### Figure 2.1. cefasRL




# Blocks

## Parameters

### "Desired" (Constant)

#### Table 2.1. "Desired" Parameters

| Parameter | Value |
|---|---|
| Constant value | 100 |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit from 'Constant value' |
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | Ts |

| Parameter | Value |
|---|---|
| Frame period | inf |

## "Mux" (Mux)

### Table 2.2. "Mux" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | 2 |
| Display option | bar |

## "RL Agent" (SubSystem)

### Table 2.3. "RL Agent" Parameters

| Parameter | Value |
|---|---|
| rlblockRLAgentAgentPrompt | agent |
| rlblockRLAgentExternalActionInportPrompt | off |
| rlblockRLAgentProvideLastActionPrompt | off |
| rlblockRLAgentProvideCumRwdPrompt | off |
| rlblockRLAgentDirectFeedthroughPrompt | on |
| rlblockRLAgentUseStrictObservationDataTypesPrompt | off |

## "Saturation" (Saturate)

### Table 2.4. "Saturation" Parameters

| Parameter | Value |
|---|---|
| Upper limit | 10 |
| Lower limit | 0 |
| Treat as gain when linearizing | on |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Same as input |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |

## "Saturation1" (Saturate)

### Table 2.5. "Saturation1" Parameters

| Parameter | Value |
|---|---|
| Upper limit | inf |
| Lower limit | 0 |
| Treat as gain when linearizing | on |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Same as input |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |

## "Sum1" (Sum)

### Table 2.6. "Sum1" Parameters

| Parameter | Value |
|---|---|
| Icon shape | round |
| List of signs | \|+- |
| Sum over | All dimensions |
| Dimension | 1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Accumulator data type | Inherit: Inherit via internal rule |
| Require all inputs to have the same data type | off |
| Lock data type settings against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | on |
| Sample time (-1 for inherited) | -1 |

# Block Execution Order

1. Constant (Constant)

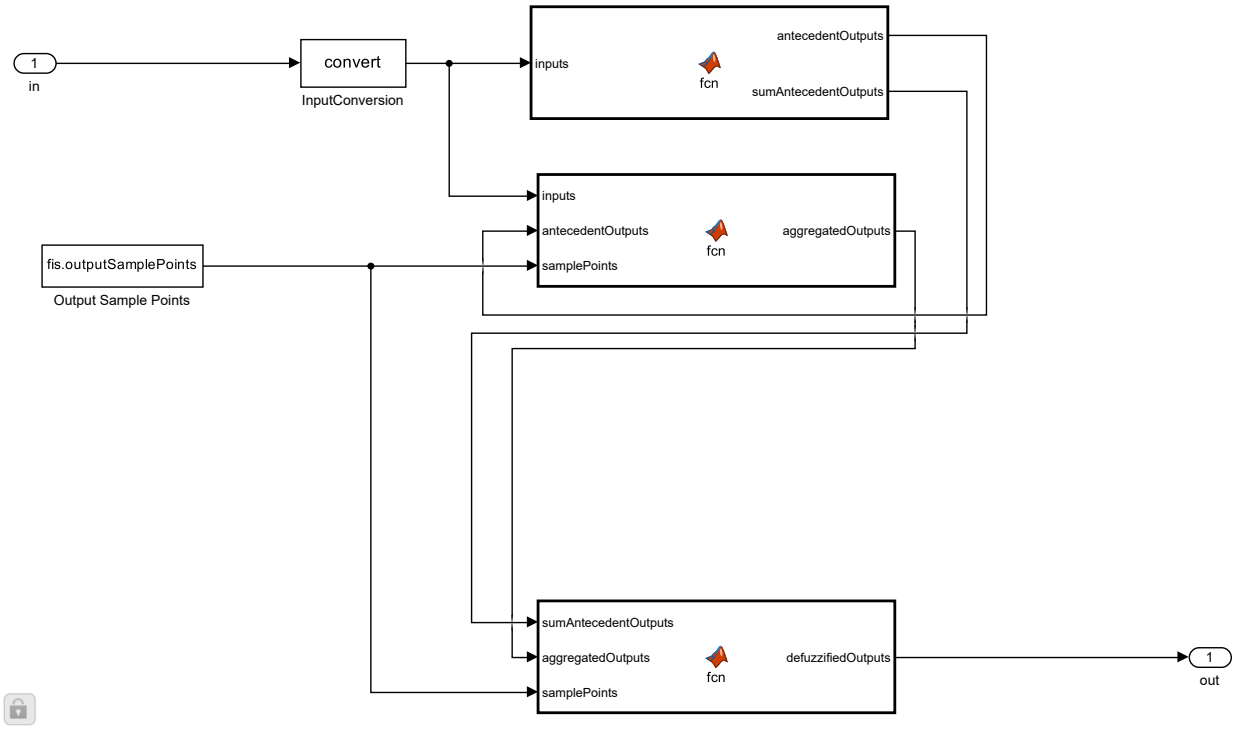
2. use external action (Constant)
3. Constant (Constant)
4. Desired (Constant)
5. Environment (TransferFcn)
6. Saturation1 (Saturate)
7. Sum1 (Sum)
8. Gain (Gain)
9. Reciprocal (Product)
10. Product (Product)
11. Delay (Delay)
12. Sum (Sum)
13. TmpSignal ConversionAtPolicy Process Experience InternalInport1 (SignalConversion)
14. Memory (Memory)
15. Memory (Memory)
16. Gain1 (Gain)
17. Saturation (Saturate)
18. Gain (Gain)
19. Saturation1 (Saturate)
20. *Reward*
    1. Output Sample Points (Constant)
    2. *Evaluate Rule Antecedents*
        1. TmpSignal ConversionAt SFunction Inport1 (SignalConversion)
        2. SFunction (S-Function)
    3. *Evaluate Rule Consequents*
        1. TmpSignal ConversionAt SFunction Inport1 (SignalConversion)
        2. SFunction (S-Function)
    4. *Defuzzify Outputs*
        1. SFunction (S-Function)
21. Gain3 (Gain)
22. gamma (Constant)
23. Product (Product)
24. Relational Operator (RelationalOperator)
25. Compare (RelationalOperator)
26. OR (Logic)
27. Gain2 (Gain)
28. Sum (Sum)
29. Policy Process Experience Internal (MATLABSystem)
30. Saturation (Saturate)
31. Scope (Scope)
32. debug (Scope)
33. Delay1 (Delay)
34. Stop Simulation (Stop)
35. Unit Delay (UnitDelay)
36. *cumsum*
    1. Unit Delay (UnitDelay)
    2. Sum (Sum)

# Chapter 3. Subsystems

# Reward

**Checksum:** 3837886408 315245549 3528919713 3348305374

### Figure 3.1. cefasRL/calculate reward/ Reward




# Blocks

## Parameters

### "Defuzzify Outputs" (MATLAB Function)

### Table 3.1. Defuzzify Outputs Function Properties

| Property | Value |
|---|---|
| Update Method | INHERITED |
| Sample Time | -1 |

| Property | Value |
|---|---|
| Support variable-size arrays | 1 |
| Saturate on integer overflow | 1 |
| Treat these inherited Simulink signal types as fi objects | Fixed-point |
| MATLAB Function block fimath | Other:UserSpecified |
| Input fi math | fimath(...<br>'RoundingMethod',fm.RoundingMethod,...<br>'ProductMode',fm.ProductMode,...<br>'ProductWordLength',fm.ProductWordLength,...<br>'ProductFractionLength',fm.ProductFractionLength,...<br>'SumMode',fm.SumMode,...<br>'SumWordLength',fm.SumWordLength,...<br>'SumFractionLength',fm.SumFractionLength...<br>) |
| Description | |

**Table 3.2. Defuzzify Outputs Argument Summary**

| Name | Scope | Port | Data Type | Size |
|---|---|---|---|---|
| sumAntecedentOutputs | Input | 1 | double | 1 |
| aggregatedOutputs | Input | 2 | double | [101, 1] |
| defuzzifiedOutputs | Output | 1 | double | 1 |
| fis | Parameter | NaN | sV9HWhWY2jKEx5wa3f6y1AE | 1 |
| samplePoints | Input | 3 | double | [1, 101] |
| SimulateUsing | Parameter | NaN | double | 1 |
| diagnostics | Parameter | NaN | sqDbSbCTGsWFYoXv0aqGscC | 1 |

## Defuzzify Outputs Function Script

```
function defuzzifiedOutputs = fcn(sumAntecedentOutputs,...
    aggregatedOutputs,fis,samplePoints,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.internal.canUseExtrinsic ...
        && (isa(aggregatedOutputs,'double') || isa(aggregatedOutputs,'sin-
gle'))

    defuzzifiedOutputs = zeros(fis.numOutputs,1,'like',aggregatedOutputs);
```

```
if fis.inputFuzzySetType==1
    if strcmp(char(fis.type),'mamdani')
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethod_double_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethod_single_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    else
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethod_double_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethod_single_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    end
else
    if strcmp(char(fis.type),'mamdani')
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethodType2_double_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applyMamdaniDefuzzificationMethodType2_single_mex'],...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    else
        if isa(aggregatedOutputs,'double')
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethodType2_double_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                'applySugenoDefuzzificationMethodType2_single_mex'],...
                sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        end
    end
```

```
    end

else
    if fis.inputFuzzySetType==1
        if isequal(fis.type,uint8('mamdani'))
            defuzzifiedOutputs = ...
                fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod(...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs = ...
                fuzzy.internal.codegen.applySugenoDefuzzificationMethod(...
                sumAntecedentOutputs,aggregatedOutputs,fis,diagnostics);
        end
    else
        if isequal(fis.type,uint8('mamdani'))
            defuzzifiedOutputs = ...
                fuzzy.internal.codegen.applyMamdaniDefuzzificationMethod-
Type2(...
                samplePoints,sumAntecedentOutputs,aggregatedOutputs, ...
                fis,diagnostics);
        else
            defuzzifiedOutputs = ...
                fuzzy.internal.codegen.applySugenoDefuzzificationMethod-
Type2(...
                sumAntecedentOutputs,aggregatedOutputs,fis,diagnostics);
        end
    end

end

end
```

### Table 3.3. Defuzzify Outputs Supporting Functions

| Function | Defined By | Path |
|---|---|---|
| char | MATLAB | |
| feval | MATLAB | |
| intmax | MATLAB | |

## "Evaluate Rule Antecedents" (MATLAB Function)

### Table 3.4. Evaluate Rule Antecedents Function Properties

| Property | Value |
|---|---|
| Update Method | INHERITED |
| Sample Time | -1 |

| Property | Value |
|---|---|
| Support variable-size arrays | 1 |
| Saturate on integer overflow | 1 |
| Treat these inherited Simulink signal types as fi objects | Fixed-point |
| MATLAB Function block fimath | Other:UserSpecified |
| Input fi math | fimath(...<br>'RoundingMethod',fm.RoundingMethod,...<br>'ProductMode',fm.ProductMode,...<br>'ProductWordLength',fm.ProductWordLength,...<br>'ProductFractionLength',fm.ProductFractionLength,...<br>'SumMode',fm.SumMode,...<br>'SumWordLength',fm.SumWordLength,...<br>'SumFractionLength',fm.SumFractionLength...<br>) |
| Description | |

**Table 3.5. Evaluate Rule Antecedents Argument Summary**

| Name | Scope | Port | Data Type | Size |
|---|---|---|---|---|
| inputs | Input | 1 | double | 2 |
| antecedentOutputs | Output | 1 | double | [25, 1] |
| fis | Parameter | NaN | sV9HWhWY2jKEx5wa3f6y1AE | 1 |
| sumAntecedentOutputs | Output | 2 | double | 1 |
| SimulateUsing | Parameter | NaN | double | 1 |
| diagnostics | Parameter | NaN | sqDbSbCTGsWFYoXv0aqGscC | 1 |

## Evaluate Rule Antecedents Function Script

```
function [antecedentOutputs,sumAntecedentOutputs] = fcn(inputs, ...
    fis,SimulateUsing,diagnostics)

if SimulateUsing==1 && coder.internal.canUseExtrinsic ...
        && (isa(inputs,'double') || isa(inputs,'single'))

    antecedentOutputs = zeros(fis.rfsSize,'like',inputs);
    sumAntecedentOutputs = zeros(fis.sumSize,'like',inputs);

    if fis.inputFuzzySetType==1
```

```
        if isa(inputs,'double')
            [antecedentOutputs(:),sumAntecedentOutputs(:)] = feval(...
                'fuzzy.internal.codegen.evaluateRuleAntecedent_dou-
ble_mex',...
                inputs,fis,diagnostics);
        else
            [antecedentOutputs(:),sumAntecedentOutputs(:)] = feval(...
                'fuzzy.internal.codegen.evaluateRuleAntecedent_sin-
gle_mex',...
                inputs,fis,diagnostics);
        end
    else
        if isa(inputs,'double')
            [antecedentOutputs(:),sumAntecedentOutputs(:)] = feval(...
                'fuzzy.internal.codegen.evaluateRuleAntecedentType2_dou-
ble_mex',...
                inputs,fis,diagnostics);
        else
            [antecedentOutputs(:),sumAntecedentOutputs(:)] = feval(...
                'fuzzy.internal.codegen.evaluateRuleAntecedentType2_sin-
gle_mex',...
                inputs,fis,diagnostics);
        end
    end

else
    if fis.inputFuzzySetType==1
        [antecedentOutputs,sumAntecedentOutputs] = ...
            fuzzy.internal.codegen.evaluateRuleAntecedent(...
            inputs,fis,diagnostics);
    else
        [antecedentOutputs,sumAntecedentOutputs] = ...
            fuzzy.internal.codegen.evaluateRuleAntecedentType2(...
            inputs,fis,diagnostics);
    end

end

end
```

**Table 3.6. Evaluate Rule Antecedents Supporting Functions**

| Function | Defined By | Path |
|---|---|---|
| feval | MATLAB | |

### "Evaluate Rule Consequents" (MATLAB Function)

### Table 3.7. Evaluate Rule Consequents Function Properties

| Property | Value |
|---|---|
| Update Method | INHERITED |
| Sample Time | -1 |
| Support variable-size arrays | 1 |
| Saturate on integer overflow | 1 |
| Treat these inherited Simulink signal types as fi objects | Fixed-point |
| MATLAB Function block fimath | Other:UserSpecified |
| Input fi math | fimath(...<br>'RoundingMethod',fm.RoundingMethod,...<br>'ProductMode',fm.ProductMode,...<br>'ProductWordLength',fm.ProductWordLength,...<br>'ProductFractionLength',fm.ProductFractionLength,...<br>'SumMode',fm.SumMode,...<br>'SumWordLength',fm.SumWordLength,...<br>'SumFractionLength',fm.SumFractionLength...<br>) |
| Description | |

### Table 3.8. Evaluate Rule Consequents Argument Summary

| Name | Scope | Port | Data Type | Size |
|---|---|---|---|---|
| inputs | Input | 1 | double | 2 |
| antecedentOutputs | Input | 2 | double | [25, 1] |
| aggregatedOutputs | Output | 1 | double | [101, 1] |
| fis | Parameter | NaN | sV9HWhWY2jKEx5wa3f6y1AE | 1 |
| samplePoints | Input | 3 | double | [1, 101] |
| SimulateUsing | Parameter | NaN | double | 1 |

### Evaluate Rule Consequents Function Script

```
function aggregatedOutputs = fcn(inputs,antecedentOutputs, ...
    fis,samplePoints,SimulateUsing)

if SimulateUsing==1 && coder.internal.canUseExtrinsic ...
        && (isa(inputs,'double') || isa(inputs,'single'))
```

```
    aggregatedOutputs = zeros(fis.aggSize,'like',inputs);

    if fis.inputFuzzySetType==1
        if strcmp(char(fis.type),'mamdani')
            if isa(inputs,'double')
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForMamdaniFIS_double_mex'],...
                    antecedentOutputs,fis,samplePoints);
            else
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForMamdaniFIS_single_mex'],...
                    antecedentOutputs,fis,samplePoints);
            end
        else
            if isa(inputs,'double')
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForSugenoFIS_double_mex'],...
                    inputs,antecedentOutputs,fis);
            else
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForSugenoFIS_single_mex'],...
                    inputs,antecedentOutputs,fis);
            end
        end
    else
        if strcmp(char(fis.type),'mamdani')
            if isa(inputs,'double')
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForMamdaniFISType2_dou-
ble_mex'],...
                    antecedentOutputs,fis,samplePoints);
            else
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForMamdaniFISType2_sin-
gle_mex'],...
                    antecedentOutputs,fis,samplePoints);
            end
        else
            if isa(inputs,'double')
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForSugenoFISType2_double_mex'],...
                    inputs,antecedentOutputs,fis);
            else
                aggregatedOutputs(:) = feval(['fuzzy.internal.codegen.' ...
                    'evaluateRuleConsequentForSugenoFISType2_single_mex'],...
                    inputs,antecedentOutputs,fis);
            end
        end
    end

else
```

```
    if fis.inputFuzzySetType==1
        if strcmp(char(fis.type),'mamdani')
            aggregatedOutputs = ...
                fuzzy.internal.codegen.evaluateRuleConsequentForMamdani-
FIS(...
                antecedentOutputs,fis,samplePoints);
        else
            aggregatedOutputs = ...
                fuzzy.internal.codegen.evaluateRuleConsequentForSugenoFIS(...
                inputs,antecedentOutputs,fis);
        end
    else
        if strcmp(char(fis.type),'mamdani')
            aggregatedOutputs = ...
                fuzzy.internal.codegen.evaluateRuleConsequentForMamdaniFIS-
Type2(...
                antecedentOutputs,fis,samplePoints);
        else
            aggregatedOutputs = ...
                fuzzy.internal.codegen.evaluateRuleConsequentForSugenoFIS-
Type2(...
                inputs,antecedentOutputs,fis);
        end
    end
end

end
```

### Table 3.9. Evaluate Rule Consequents Supporting Functions

| Function | Defined By | Path |
|---|---|---|
| char | MATLAB | |
| feval | MATLAB | |
| intmax | MATLAB | |

### "in" (Inport)

### Table 3.10. "in" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "InputConversion" (DataTypeConversion)

### Table 3.11. "InputConversion" Parameters

| Parameter | Value |
|---|---|
| Output minimum | [] |
| Output maximum | [] |
| Output data type | DataType |
| Lock output data type setting against changes by the fixed-point tools | off |
| Input and output to have equal | Real World Value (RWV) |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "out" (Outport)

### Table 3.12. "out" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |

| Parameter | Value |
|---|---|
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "Output Sample Points" (Constant)

#### Table 3.13. "Output Sample Points" Parameters

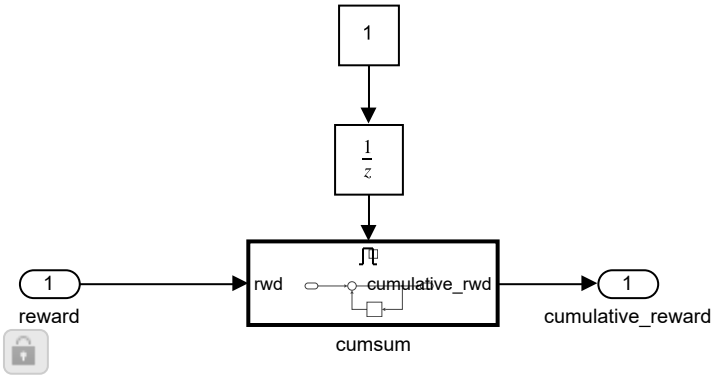
| Parameter | Value |
|---|---|
| Constant value | fis.outputSamplePoints |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit from 'Constant value' |
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | inf |
| Frame period | inf |

## Block Execution Order

1. Output Sample Points (Constant)
2. *Evaluate Rule Antecedents*
    1. TmpSignal ConversionAt SFunction Inport1 (SignalConversion)
    2. SFunction (S-Function)
3. *Evaluate Rule Consequents*
    1. TmpSignal ConversionAt SFunction Inport1 (SignalConversion)
    2. SFunction (S-Function)
4. *Defuzzify Outputs*
    1. SFunction (S-Function)

# accumulate_reward

### Figure 3.2. cefasRL/RL Agent/accumulate_reward




# Blocks

## Parameters

### "Constant" (Constant)

### Table 3.14. "Constant" Parameters

| Parameter | Value |
|---|---|
| Constant value | 1 |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit from 'Constant value' |
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | inf |
| Frame period | inf |

### "cumulative_reward" (Outport)

### Table 3.15. "cumulative_reward" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |

| Parameter | Value |
|---|---|
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "reward" (Inport)

### Table 3.16. "reward" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

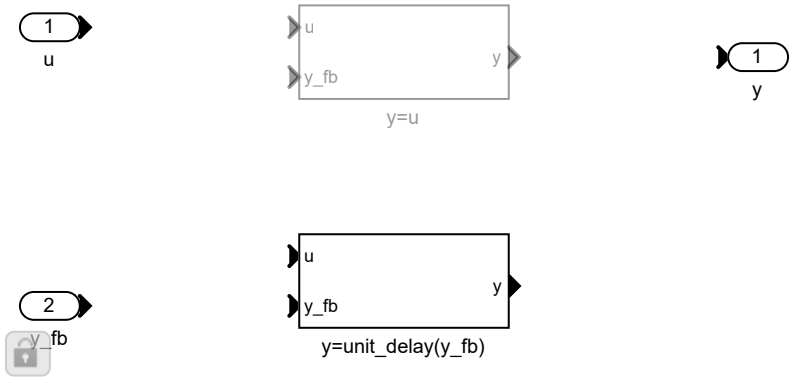
### "Unit Delay" (UnitDelay)

### Table 3.17. "Unit Delay" Parameters

| Parameter | Value |
|---|---|
| Initial condition | 0 |
| Input processing | Elements as channels (sample based) |
| Sample time (-1 for inherited) | -1 |
| State name must resolve to Simulink signal object | off |

# act_delayable

### Figure 3.3. cefasRL/RL Agent/act_delayable




# Blocks

## Parameters

### "u" (Inport)

### Table 3.18. "u" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |

| Parameter | Value |
|---|---|
| Data type | Inherit: auto |

### "y" (Outport)

### Table 3.19. "y" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | on |

### "y_fb" (Inport)

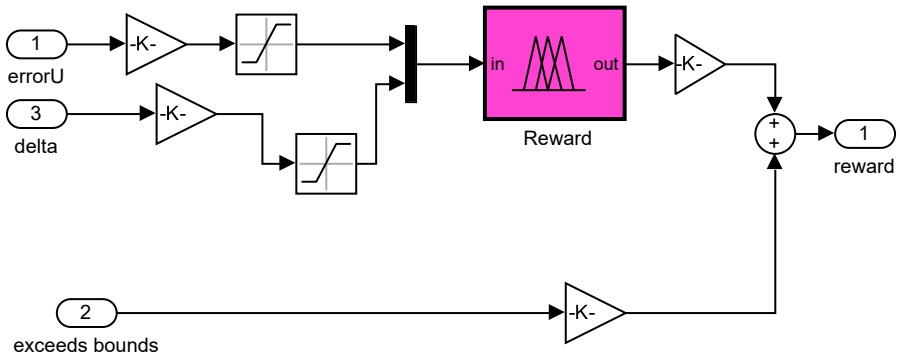
### Table 3.20. "y_fb" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |

| Parameter | Value |
|---|---|
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

# calculate reward

### Figure 3.4. cefasRL/calculate reward




# Blocks

## Parameters

### " Reward" (SubSystem)

### Table 3.21. " Reward" Parameters

| Parameter | Value |
|---|---|
| fuzzydialogsflcMask_ParameterLabel_FIS | 'Reward.fis' |
| fuzzydialogsflcMask_ParameterLabel_NumSamples | 101 |
| fuzzydialogsflcMask_ParameterLabel_DataType | double |
| fuzzydialogsflcMask_OutportLabel_FuzzifiedInputs | off |
| fuzzydialogsflcMask_OutportLabel_RuleFiringStrengths | off |
| fuzzydialogsflcMask_OutportLabel_RuleOutputs | off |
| fuzzydialogsflcMask_OutportLabel_AggregatedOutputs | off |
| fuzzydialogsflcMask_ParameterLabel_SimulateUsing | Interpreted execution |
| fuzzydialogsflcMask_ParameterLabel_OutOfRangeInputValueDiagnostic | warning |

| Parameter | Value |
|---|---|
| fuzzydialogsflcMask_ParameterLabel_ZeroRuleFiringStrengthDiagnostic | warning |
| fuzzydialogsflcMask_ParameterLabel_EmptyOutputFuzzySetDiagnostic | warning |

### "delta" (Inport)

### Table 3.22. "delta" Parameters

| Parameter | Value |
|---|---|
| Port number | 3 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "errorU" (Inport)

### Table 3.23. "errorU" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "exceeds bounds" (Inport)

### Table 3.24. "exceeds bounds" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Gain" (Gain)

### Table 3.25. "Gain" Parameters

| Parameter | Value |
|---|---|
| Gain | 10.00 |
| Multiplication | Element-wise(K.*u) |
| Parameter minimum | [] |
| Parameter maximum | [] |
| Parameter data type | Inherit: Inherit via internal rule |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "Gain1" (Gain)

### Table 3.26. "Gain1" Parameters

| Parameter | Value |
|---|---|
| Gain | 1.000 |
| Multiplication | Element-wise(K.*u) |
| Parameter minimum | [] |
| Parameter maximum | [] |
| Parameter data type | Inherit: Inherit via internal rule |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |

| Parameter | Value |
|---|---|
| Sample time (-1 for inherited) | -1 |

### "Gain2" (Gain)

### Table 3.27. "Gain2" Parameters

| Parameter | Value |
|---|---|
| Gain | -100 |
| Multiplication | Element-wise(K.*u) |
| Parameter minimum | [] |
| Parameter maximum | [] |
| Parameter data type | Inherit: Inherit via internal rule |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "Gain3" (Gain)

### Table 3.28. "Gain3" Parameters

| Parameter | Value |
|---|---|
| Gain | 5.00 |
| Multiplication | Element-wise(K.*u) |
| Parameter minimum | [] |
| Parameter maximum | [] |
| Parameter data type | Inherit: Inherit via internal rule |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |

| Parameter | Value |
|---|---|
| Lock output data type setting against changes by the fixed-point t ools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "Mux" (Mux)

### Table 3.29. "Mux" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | 2 |
| Display option | bar |

### "reward" (Outport)

### Table 3.30. "reward" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |

| Parameter | Value |
|---|---|
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "Saturation" (Saturate)

### Table 3.31. "Saturation" Parameters

| Parameter | Value |
|---|---|
| Upper limit | 3 |
| Lower limit | -1 |
| Treat as gain when linearizing | on |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Same as input |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |

### "Saturation1" (Saturate)

### Table 3.32. "Saturation1" Parameters

| Parameter | Value |
|---|---|
| Upper limit | 4 |
| Lower limit | -4 |
| Treat as gain when linearizing | on |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Same as input |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |

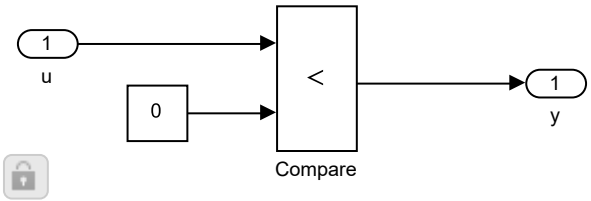
### "Sum" (Sum)

### Table 3.33. "Sum" Parameters

| Parameter | Value |
|---|---|
| Icon shape | round |
| List of signs | ++ |
| Sum over | All dimensions |
| Dimension | 1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | double |
| Accumulator data type | Inherit: Inherit via internal rule |
| Require all inputs to have the same data type | off |
| Lock data type settings against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

# Compare To Zero

### Figure 3.5. cefasRL/stop simulation/Compare To Zero




# Blocks

## Parameters

### "Compare" (RelationalOperator)

### Table 3.34. "Compare" Parameters

| Parameter | Value |
|---|---|
| Relational operator | < |
| Require all inputs to have the same data type | on |
| Output data type | boolean |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Integer rounding mode | Nearest |

### "Constant" (Constant)

### Table 3.35. "Constant" Parameters

| Parameter | Value |
|---|---|
| Constant value | 0 |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via back pr opagation |
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | inf |
| Frame period | inf |

### "u" (Inport)

### Table 3.36. "u" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

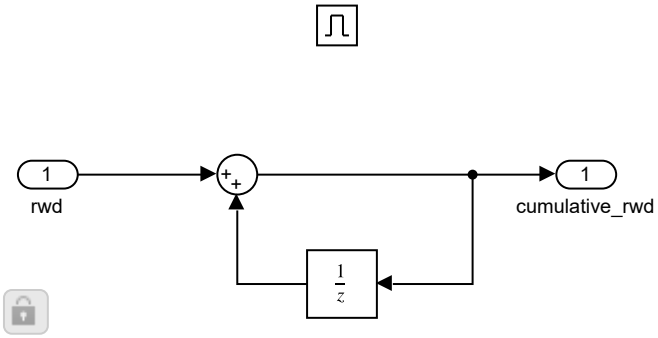
### "y" (Outport)

### Table 3.37. "y" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | on |

# cumsum

### Figure 3.6. cefasRL/RL Agent/accumulate_reward/cumsum




# Blocks

## Parameters

### "cumulative_rwd" (Outport)

### Table 3.38. "cumulative_rwd" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |

| Parameter | Value |
|---|---|
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "Enable" (EnablePort)

### Table 3.39. "Enable" Parameters

| Parameter | Value |
|---|---|
| States when enabling | held |
| Propagate sizes of variable-size signals | Only when enabling |
| Show output port | off |
| Enable zero-crossing detection | on |
| Port dimensions | 1 |
| Sample time | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | double |
| Interpolate data | on |

### "rwd" (Inport)

### Table 3.40. "rwd" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Sum" (Sum)

#### Table 3.41. "Sum" Parameters

| Parameter | Value |
|---|---|
| Icon shape | round |
| List of signs | \|++ |
| Sum over | All dimensions |
| Dimension | 1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Accumulator data type | Inherit: Inherit via internal rule |
| Require all inputs to have the same data type | off |
| Lock data type settings against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

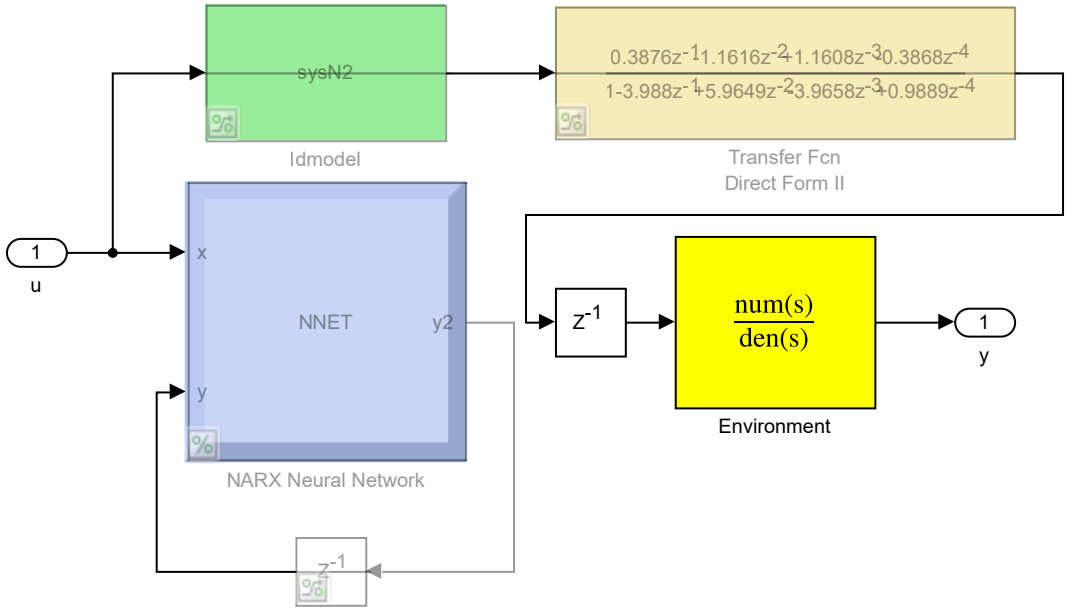
### "Unit Delay" (UnitDelay)

#### Table 3.42. "Unit Delay" Parameters

| Parameter | Value |
|---|---|
| Initial condition | 0 |
| Input processing | Elements as channels (sample based) |
| Sample time (-1 for inherited) | -1 |
| State name must resolve to Simulink signal object | off |

# Environment

### Figure 3.7. cefasRL/Environment




# Blocks

## Parameters

### "Delay1" (Delay)

### Table 3.43. "Delay1" Parameters

| Parameter | Value |
|---|---|
| Delay length source | Dialog |
| Delay length | 1 |
| Delay upper limit | 100 |
| Initial condition source | Dialog |
| Initial condition | 25 |
| External reset | None |
| Show enable port | off |
| Prevent direct feedthrough | off |
| Diagnostic for delay length | None |

| Parameter | Value |
|---|---|
| Remove delay length check in generated code | off |
| Input processing | Elements as channels (sample based) |
| Use circular buffer for state | off |
| Sample time (-1 for inherited) | -1 |
| State name must resolve to Simulink signal object | off |

### "Environment" (TransferFcn)

### Table 3.44. "Environment" Parameters

| Parameter | Value |
|---|---|
| Numerator coefficients | [0.317083839607784 0.000521634142681 0.000189847434189 0.000000393885142] |
| Denominator coefficients | [1.000000000000000 0.009075547001992 0.000607241576411 0.000005460746852 0.000000003331245] |
| State Name (e.g., 'position') | '' |

### "u" (Inport)

### Table 3.45. "u" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "y" (Outport)

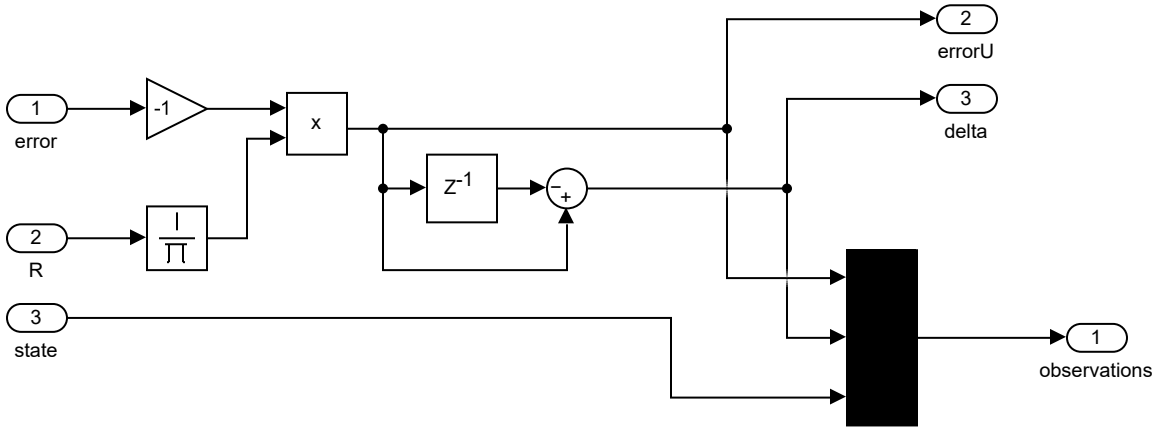
### Table 3.46. "y" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |

| Parameter | Value |
|---|---|
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

# generate observations

### Figure 3.8. cefasRL/generate observations



# Blocks

## Parameters

### "Delay" (Delay)

#### Table 3.47. "Delay" Parameters

| Parameter | Value |
|---|---|
| Delay length source | Dialog |
| Delay length | 1 |
| Delay upper limit | 100 |
| Initial condition source | Dialog |
| Initial condition | 0 |
| External reset | None |
| Show enable port | off |
| Prevent direct feedthrough | off |
| Diagnostic for delay length | None |
| Remove delay length check in generated code | off |
| Input processing | Elements as channels (sample based) |
| Use circular buffer for state | off |
| Sample time (-1 for inherited) | -1 |
| State name must resolve to Simulink signal object | off |

### "delta" (Outport)

#### Table 3.48. "delta" Parameters

| Parameter | Value |
|---|---|
| Port number | 3 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |

| Parameter | Value |
|---|---|
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "error" (Inport)

### Table 3.49. "error" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "errorU" (Outport)

### Table 3.50. "errorU" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

| Parameter | Value |
|---|---|
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "Gain" (Gain)

### Table 3.51. "Gain" Parameters

| Parameter | Value |
|---|---|
| Gain | -1 |
| Multiplication | Element-wise(K.*u) |
| Parameter minimum | [] |
| Parameter maximum | [] |
| Parameter data type | Inherit: Inherit via internal rule |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "Mux" (Mux)

### Table 3.52. "Mux" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | 3 |
| Display option | bar |

### "observations" (Outport)

### Table 3.53. "observations" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "Product" (Product)

### Table 3.54. "Product" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | 2 |
| Multiplication | Element-wise(.*) |
| Multiply over | All dimensions |
| Dimension | 1 |
| Require all inputs to have the same data type | off |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via interna l rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "R" (Inport)

### Table 3.55. "R" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Reciprocal" (Product)

### Table 3.56. "Reciprocal" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | / |
| Multiplication | Element-wise(.*) |
| Multiply over | All dimensions |

| Parameter | Value |
|---|---|
| Dimension | 1 |
| Require all inputs to have the same data type | off |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "state" (Inport)

### Table 3.57. "state" Parameters

| Parameter | Value |
|---|---|
| Port number | 3 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Sum" (Sum)

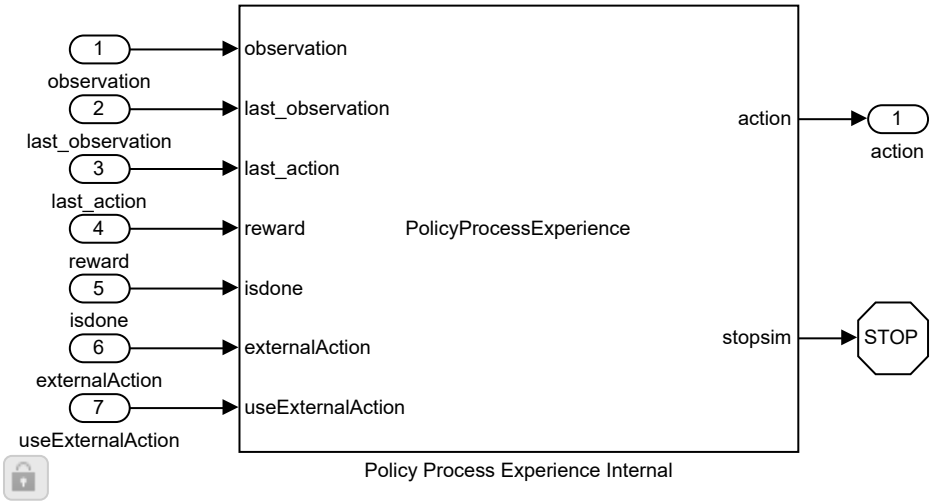
### Table 3.58. "Sum" Parameters

| Parameter | Value |
|---|---|
| Icon shape | round |
| List of signs | \|-+ |
| Sum over | All dimensions |
| Dimension | 1 |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via internal rule |
| Accumulator data type | Inherit: Inherit via internal rule |
| Require all inputs to have the same data type | off |

| Parameter | Value |
|---|---|
| Lock data type settings against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

# Policy Process Experience

### Figure 3.9. cefasRL/RL Agent/Policy Process Experience




# Blocks

## Parameters

### "action" (Outport)

### Table 3.59. "action" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

| Parameter | Value |
|---|---|
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | on |

### "externalAction" (Inport)

### Table 3.60. "externalAction" Parameters

| Parameter | Value |
|---|---|
| Port number | 6 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "isdone" (Inport)

### Table 3.61. "isdone" Parameters

| Parameter | Value |
|---|---|
| Port number | 5 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |

| Parameter | Value |
|---|---|
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "last_action" (Inport)

### Table 3.62. "last_action" Parameters

| Parameter | Value |
|---|---|
| Port number | 3 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "last_observation" (Inport)

### Table 3.63. "last_observation" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "observation" (Inport)

### Table 3.64. "observation" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |

| Parameter | Value |
|---|---|
| Data type | Inherit: auto |

### "Policy Process Experience Internal" (MATLABSystem)

### Table 3.65. "Policy Process Experience Internal" Parameters

| Parameter | Value |
|---|---|
| Experience processor | blockparams.ExperienceProcessor |
| Observation interface | blockparams.ObservationInterface |
| Action interface | blockparams.ActionInterface |
| Block ID | blockparams.BlockID |
| SystemBlockMATLABSystemSimulateUsing | Interpreted execution |

### "reward" (Inport)

### Table 3.66. "reward" Parameters

| Parameter | Value |
|---|---|
| Port number | 4 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

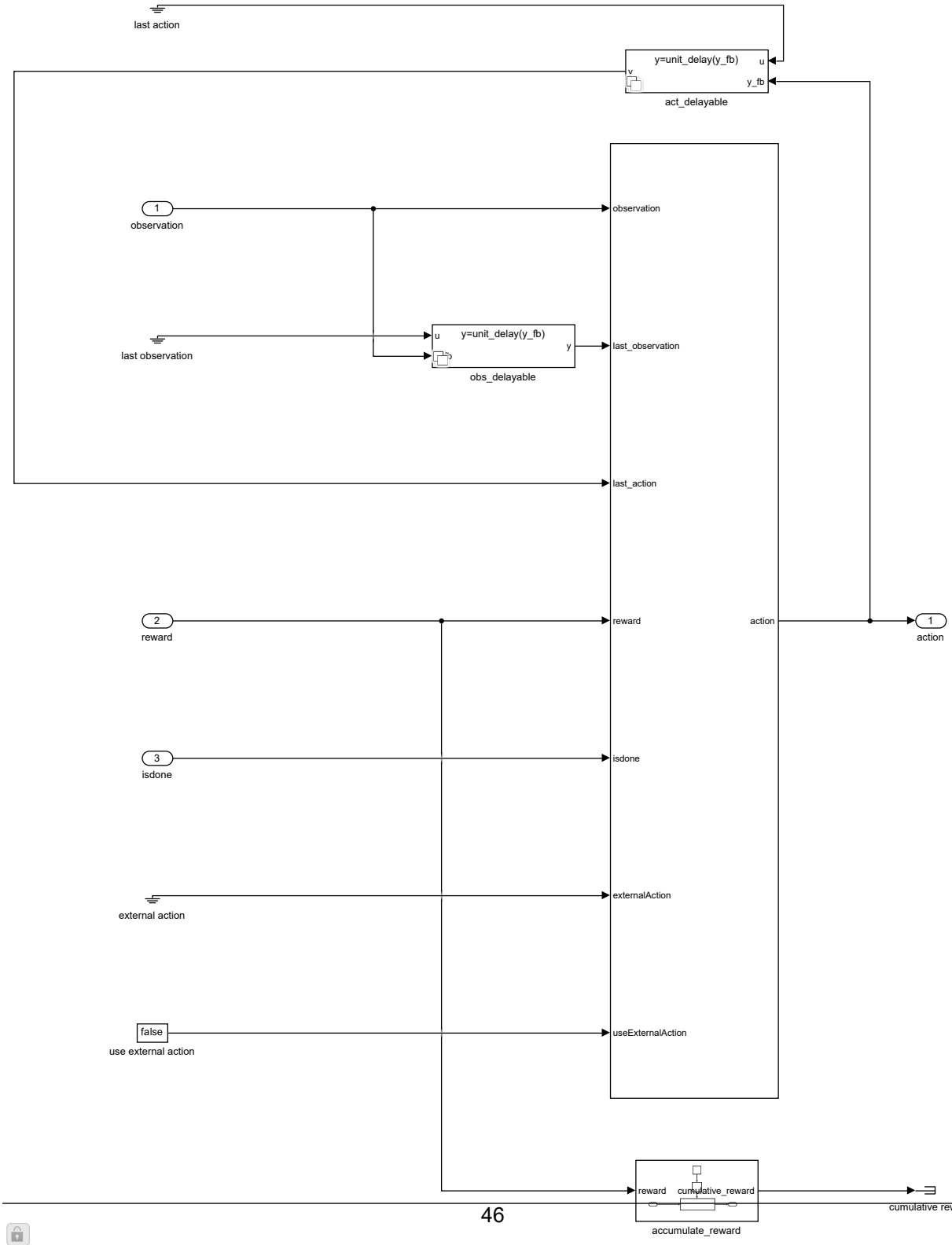
### "useExternalAction" (Inport)

### Table 3.67. "useExternalAction" Parameters

| Parameter | Value |
|---|---|
| Port number | 7 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

# RL Agent

## Figure 3.10. cefasRL/RL Agent



# Blocks

## Parameters

### "act_delayable" (SubSystem)

#### Table 3.68. "act_delayable" Parameters

| Parameter | Value |
|---|---|
| Variant ID (VID) (VID=0 y = u, VID=1 y = unit_delay(y_fb)) | 1*(~ProvideLastAction) |
| Initial Conditions | 0 |
| Sample Time | blockparams.Ts |

### "action" (Outport)

#### Table 3.69. "action" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |

| Parameter | Value |
|---|---|
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

### "isdone" (Inport)

### Table 3.70. "isdone" Parameters

| Parameter | Value |
|---|---|
| Port number | 3 |
| Port dimensions (-1 for inherited) | 1 |
| Sample time (-1 for inherited) | blockparams.Ts |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "obs_delayable" (SubSystem)

### Table 3.71. "obs_delayable" Parameters

| Parameter | Value |
|---|---|
| Variant ID (VID) (VID=0 y = u, VID=1 y = unit_delay(y_fb)) | 1 |
| Initial Conditions | 0 |
| Sample Time | blockparams.Ts |

### "observation" (Inport)

### Table 3.72. "observation" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | blockparams.ObservationDimensions |
| Sample time (-1 for inherited) | blockparams.Ts |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Policy Process Experience" (SubSystem)

### Table 3.73. "Policy Process Experience" Parameters

| Parameter | Value |
|---|---|
| Experience Processor | blockparams.ExperienceProcessor |
| Observation Specifications | blockparams.ObservationInfo |
| Action Specifications | blockparams.ActionInfo |
| Block ID | blockparams.BlockID |

### "reward" (Inport)

### Table 3.74. "reward" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | 1 |
| Sample time (-1 for inherited) | blockparams.Ts |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

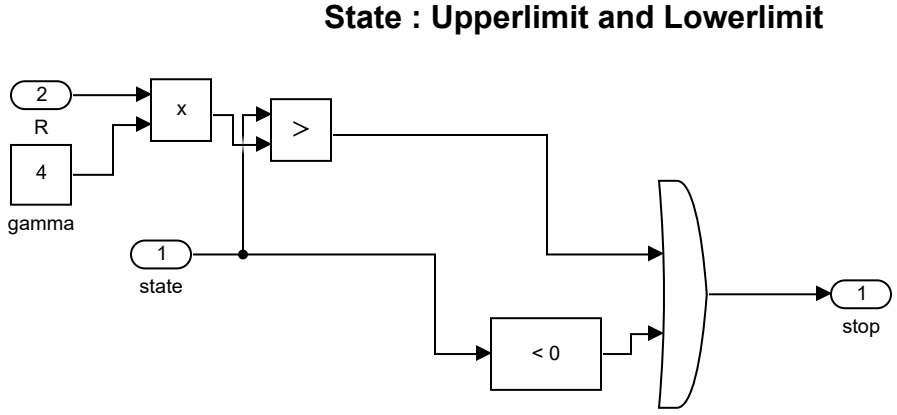
### "use external action" (Constant)

### Table 3.75. "use external action" Parameters

| Parameter | Value |
|---|---|
| Constant value | false |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via back pr opagation |
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | inf |
| Frame period | inf |

# stop simulation

### Figure 3.11. cefasRL/stop simulation




# Blocks

## Parameters

### "Compare To Zero" (SubSystem)

### Table 3.76. "Compare To Zero" Parameters

| Parameter | Value |
|---|---|
| SimulinkmasksOperator_MP | < |
| SimulinkmasksOutputDataType_MP | boolean |
| SimulinkmasksEnableZerocrossingDetection_MP | on |

### "gamma" (Constant)

### Table 3.77. "gamma" Parameters

| Parameter | Value |
|---|---|
| Constant value | 4 |
| Interpret vector parameters as 1-D | on |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit from 'Constant value' |

| Parameter | Value |
|---|---|
| Lock output data type setting against changes by the fixed-point tools | off |
| Sample time | Ts |
| Frame period | inf |

### "OR" (Logic)

### Table 3.78. "OR" Parameters

| Parameter | Value |
|---|---|
| Operator | OR |
| Number of input ports | 2 |
| Icon shape | distinctive |
| Require all inputs and output to have the same data type | off |
| Output data type | boolean |
| Sample time (-1 for inherited) | -1 |

### "Product" (Product)

### Table 3.79. "Product" Parameters

| Parameter | Value |
|---|---|
| Number of inputs | 2 |
| Multiplication | Element-wise(.*) |
| Multiply over | All dimensions |
| Dimension | 1 |
| Require all inputs to have the same data type | off |
| Output minimum | [] |
| Output maximum | [] |
| Output data type | Inherit: Inherit via interna l rule |
| Lock output data type setting against changes by the fixed-point tools | off |
| Integer rounding mode | Floor |
| Saturate on integer overflow | off |
| Sample time (-1 for inherited) | -1 |

### "R" (Inport)

#### Table 3.80. "R" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "Relational Operator" (RelationalOperator)

#### Table 3.81. "Relational Operator" Parameters

| Parameter | Value |
|---|---|
| Relational operator | > |
| Require all inputs to have the same data type | off |
| Output data type | boolean |
| Enable zero-crossing detection | on |
| Sample time (-1 for inherited) | -1 |
| Integer rounding mode | Simplest |

### "state" (Inport)

#### Table 3.82. "state" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

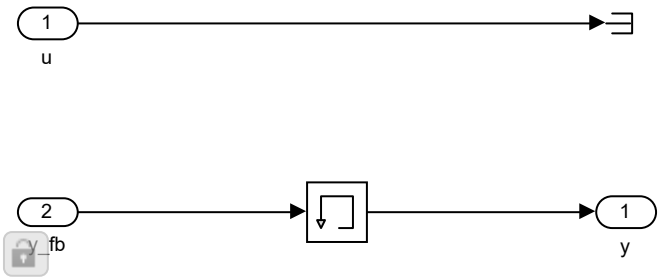
### "stop" (Outport)

### Table 3.83. "stop" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | off |

# y=unit_delay(y_fb)

**Figure 3.12. cefasRL/RL Agent/act_delayable/y=unit_delay(y_fb)**




# Blocks

## Parameters

### "Memory" (Memory)

**Table 3.84. "Memory" Parameters**

| Parameter | Value |
|---|---|
| Initial condition | IC |
| Inherit sample time | on |
| Direct feedthrough of input during linearization | off |
| Treat as a unit delay when linearizing with discrete sample time | on |
| State name must resolve to Simulink signal object | off |

### "u" (Inport)

**Table 3.85. "u" Parameters**

| Parameter | Value |
|---|---|
| Port number | 1 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | -1 |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |

### "y" (Outport)

#### Table 3.86. "y" Parameters

| Parameter | Value |
|---|---|
| Port number | 1 |
| Icon display | Port number |
| Output function call | off |
| Minimum | [] |
| Maximum | [] |
| Data type | Inherit: auto |
| Lock output data type setting against changes by the fixed-point tools | off |
| Output as nonvirtual bus in parent model | off |
| Bus virtuality | inherit |
| Data mode | inherit |
| Unit (e.g., m, m/s^2, N*m) | inherit |
| Port dimensions (-1 for inherited) | -1 |
| Variable-size signal | Inherit |
| Sample time (-1 for inherited) | -1 |
| Ensure outport is virtual | off |
| Source of initial output value | Dialog |
| Output when disabled | held |
| Initial output | [] |
| MustResolveToSignalObject | off |
| Specify output when source is unconnected | off |
| Constant value | 0 |
| Interpret vector parameters as 1-D | on |

### "y_fb" (Inport)

#### Table 3.87. "y_fb" Parameters

| Parameter | Value |
|---|---|
| Port number | 2 |
| Port dimensions (-1 for inherited) | -1 |
| Sample time (-1 for inherited) | Ts |
| Minimum | [] |
| Maximum | [] |

| Parameter | Value |
| --- | --- |
| Data type | Inherit: auto |

# Chapter 4. System Design Variables

## Design Variable Summary

### Table 4.1. Design Variables

| Variable Name | Parent Blocks | Size | Bytes | Class | Value |
|---|---|---|---|---|---|
| Reward | Reward | 1x1 | 134415 | mamfis | <mamfis> |
| Ts | Desired<br>RL Agent<br>gamma | 1x1 | 8 | double | 1.2273 |
| agent | RL Agent | 1x1 | 8 | rl.agent.rlDDPGAgent | <rl.agent.rlDDPGAgent> |

## Design Variable Details

**Ts.** 1.2273

**Used by Blocks:**

- cefasRL/Desired
- cefasRL/stop simulation/gamma

**Resolved in:** base workspace

### Table 4.2. agent

| Property | Value |
|---|---|
| ExperienceBuffer | agent.ExperienceBuffer |
| AgentOptions | agent.AgentOptions |
| UseExplorationPolicy | false |
| ObservationInfo | agent.ObservationInfo |
| ActionInfo | agent.ActionInfo |
| SampleTime | 1.2273 |

### Table 4.3. agent.ExperienceBuffer

| Property | Value |
|---|---|

| | |
|---|---|
| MaxLength | 1000000 |
| Length | 0 |

### Table 4.4. agent.AgentOptions

| Property | Value |
|---|---|
| NoiseOptions | agent.AgentOptions.NoiseOptions |
| ActorOptimizerOptions | agent.AgentOptions.ActorOptimizerOptions |
| CriticOptimizerOptions | agent.AgentOptions.CriticOptimizerOptions |
| BatchDataRegularizerOptions | |
| TargetSmoothFactor | 1.0000e-03 |
| TargetUpdateFrequency | 1 |
| ResetExperienceBufferBeforeTraining | false |
| SequenceLength | 1 |
| MiniBatchSize | 64 |
| NumStepsToLookAhead | 1 |
| ExperienceBufferLength | 1000000 |
| SampleTime | 1.2273 |
| DiscountFactor | 1 |
| InfoToSave | agent.AgentOptions.InfoToSave |

### Table 4.5. agent.ObservationInfo

| Property | Value |
|---|---|
| LowerLimit | [-1.5;<br>-Inf;<br>0] |
| UpperLimit | [Inf;<br>Inf;<br>Inf] |
| Name | observations |
| Description | error, delta-error, state |
| Dimension | [3 1] |
| DataType | double |

### Table 4.6. agent.ActionInfo

| Property | Value |
|---|---|

| | |
|---|---|
| LowerLimit | 0 |
| UpperLimit | 10 |
| Name | act |
| Description | |
| Dimension | [1 1] |
| DataType | double |

### Table 4.7. agent.AgentOptions.NoiseOptions

| Property | Value |
|---|---|
| InitialAction | 0 |
| Mean | 0 |
| MeanAttractionConstant | 0.1500 |
| StandardDeviationDecayRate | 1.0000e-05 |
| StandardDeviation | 0.3000 |
| StandardDeviationMin | 0 |

### Table 4.8. agent.AgentOptions.ActorOptimizerOptions

| Property | Value |
|---|---|
| LearnRate | 1.0000e-04 |
| GradientThreshold | 1 |
| GradientThresholdMethod | l2norm |
| L2RegularizationFactor | 1.0000e-04 |
| Algorithm | adam |
| OptimizerParameters | agent.AgentOptions.ActorOptimizerOptions.OptimizerParameters |

### Table 4.9. agent.AgentOptions.CriticOptimizerOptions

| Property | Value |
|---|---|
| LearnRate | 1.0000e-03 |
| GradientThreshold | 1 |
| GradientThresholdMethod | l2norm |
| L2RegularizationFactor | 1.0000e-04 |
| Algorithm | adam |
| OptimizerParameters | agent.AgentOptions.CriticOptimizerOptions.OptimizerParameters |

### Table 4.10. agent.AgentOptions.InfoToSave

| Field | Value |
|---|---|
| ExperienceBuffer | false |
| Optimizer | false |
| PolicyState | false |
| Target | false |

### Table 4.11. agent.AgentOptions.ActorOptimizerOptions.OptimizerParameters

| Property | Value |
|---|---|
| Momentum | Not applicable |
| Epsilon | 1.0000e-08 |
| GradientDecayFactor | 0.9000 |
| SquaredGradientDecayFactor | 0.9990 |

### Table 4.12. agent.AgentOptions.CriticOptimizerOptions.OptimizerParameters

| Property | Value |
|---|---|
| Momentum | Not applicable |
| Epsilon | 1.0000e-08 |
| GradientDecayFactor | 0.9000 |
| SquaredGradientDecayFactor | 0.9990 |

**Used by Blocks:**

- cefasRL/RL Agent

**Resolved in:** base workspace

# Chapter 5. Requirements

cefasRL does not contain requirements traceability links.

# Chapter 6. System Model Configuration

Source: Model
Source Name: cefasRL

### Table 6.1. cefasRL Configuration Set

| Property | Value |
|---|---|
| Description | |
| Components | [cefasRL Configuration Set.Components(1), cefasRL Configuration Set.Components(2), cefasRL Configuration Set.Components(3), cefasRL Configuration Set.Components(4), cefasRL Configuration Set.Components(5), cefasRL Configuration Set.Components(6), cefasRL Configuration Set.Components(7), cefasRL Configuration Set.Components(8), cefasRL Configuration Set.Components(9), cefasRL Configuration Set.Components(10)] |
| Name | Configuration |

### Table 6.2. cefasRL Configuration Set.Components(1)

| Property | Value |
|---|---|
| Name | Solver |
| Description | |
| Components | |
| StartTime | 0.0 |
| StopTime | 5000 |
| AbsTol | auto |
| AutoScaleAbsTol | on |
| FixedStep | auto |
| InitialStep | auto |
| MaxOrder | 5 |
| ZcThreshold | auto |
| ConsecutiveZCsStepRelTol | 10*128*eps |
| MaxConsecutiveZCs | 1000 |
| ExtrapolationOrder | 4 |
| NumberNewtonIterations | 1 |
| MaxStep | auto |

| | |
|---|---|
| MinStep | auto |
| MaxConsecutiveMinStep | 1 |
| RelTol | 1e-3 |
| EnableMultiTasking | off |
| AllowMultiTaskInputOutput | off |
| ConcurrentTasks | off |
| SolverName | VariableStepAuto |
| SolverType | Variable-step |
| SolverJacobianMethodControl | auto |
| DaesscMode | auto |
| ShapePreserveControl | DisableAll |
| ZeroCrossControl | UseLocalSettings |
| ZeroCrossAlgorithm | Nonadaptive |
| SolverResetMethod | Fast |
| PositivePriorityOrder | off |
| AutoInsertRateTranBlk | off |
| SampleTimeConstraint | Unconstrained |
| InsertRTBMode | Whenever possible |
| SampleTimeProperty | |
| DecoupledContinuousIntegration | off |
| MinimalZcImpactIntegration | off |
| ODENIntegrationMethod | ode3 |
| EnableFixedStepZeroCrossing | off |
| MaxZcPerStep | 2 |
| MaxZcBracketingIterations | 10 |

**Table 6.3. cefasRL Configuration Set.Components(2)**

| **Property** | **Value** |
|---|---|
| Name | Data Import/Export |
| Description | |
| Components | |
| Decimation | 1 |
| ExternalInput | [t, u] |
| FinalStateName | xFinal |
| InitialState | xInitial |
| LimitDataPoints | off |

| | |
|---|---|
| MaxDataPoints | 1000 |
| LoadExternalInput | off |
| LoadInitialState | off |
| SaveFinalState | off |
| SaveOperatingPoint | off |
| SaveFormat | Dataset |
| SaveOutput | on |
| SaveState | off |
| SignalLogging | on |
| DSMLogging | on |
| StreamToWks | on |
| InspectSignalLogs | off |
| SaveTime | on |
| ReturnWorkspaceOutputs | on |
| StateSaveName | xout |
| TimeSaveName | tout |
| OutputSaveName | yout |
| SignalLoggingName | logsout |
| DSMLoggingName | dsmout |
| OutputOption | RefineOutputTimes |
| OutputTimes | [] |
| ReturnWorkspaceOutputsName | out |
| Refine | 1 |
| LoggingToFile | off |
| DatasetSignalFormat | timeseries |
| LoggingFileName | out.mat |
| LoggingIntervals | [-inf, inf] |

**Table 6.4. cefasRL Configuration Set.Components(3)**

| **Property** | **Value** |
|---|---|
| Name | Optimization |
| Description | |
| Components | |
| BlockReduction | on |
| BooleanDataType | on |
| ConditionallyExecuteInputs | on |

| | |
|---|---|
| DefaultParameterBehavior | Tunable |
| InlineParams | off |
| UseDivisionForNetSlopeComputation | off |
| GainParamInheritBuiltInType | off |
| UseFloatMulNetSlope | off |
| InheritOutputTypeSmallerThanSingle | off |
| DefaultUnderspecifiedDataType | double |
| UseSpecifiedMinMax | off |
| InlineInvariantSignals | off |
| OptimizeBlockIOStorage | on |
| BufferReuse | on |
| ReuseModelBlockBuffer | on |
| GlobalBufferReuse | on |
| GlobalVariableUsage | None |
| StrengthReduction | off |
| AdvancedOptControl | |
| ExpressionFolding | on |
| BooleansAsBitfields | off |
| BitfieldContainerType | uint_T |
| BitwiseOrLogicalOp | Same as modeled |
| EnableMemcpy | on |
| MemcpyThreshold | 64 |
| PassReuseOutputArgsAs | Structure reference |
| PassReuseOutputArgsThreshold | 12 |
| LocalBlockOutputs | on |
| RollThreshold | 5 |
| StateBitsets | off |
| DataBitsets | off |
| ActiveStateOutputEnumStorageType | Native Integer |
| ZeroExternalMemoryAtStartup | on |
| ZeroInternalMemoryAtStartup | on |
| InitFltsAndDblsToZero | off |
| NoFixptDivByZeroProtection | off |
| EfficientFloat2IntCast | off |
| EfficientMapNaN2IntZero | on |
| LifeSpan | auto |

| | |
|---|---|
| EvaledLifeSpan | Inf |
| ClockResolution | -1 |
| MaxStackSize | Inherit from target |
| BufferReusableBoundary | on |
| RemoveLocalVariableInitialization | on |
| SimCompilerOptimization | off |
| AccelVerboseBuild | off |
| OptimizeBlockOrder | off |
| OptimizeDataStoreBuffers | on |
| BusAssignmentInplaceUpdate | on |
| DifferentSizesBufferReuse | off |
| UseRowMajorAlgorithm | off |
| OptimizationLevel | level2 |
| OptimizationPriority | Balanced |
| OptimizationCustomize | on |
| LabelGuidedReuse | off |
| MultiThreadedLoops | off |
| DenormalBehavior | GradualUnderflow |
| EfficientTunableParamExpr | off |

**Table 6.5. cefasRL Configuration Set.Components(4)**

| **Property** | **Value** |
|---|---|
| Name | Diagnostics |
| Description | |
| Components | |
| RTPrefix | error |
| ConsistencyChecking | none |
| ArrayBoundsChecking | none |
| SignalInfNanChecking | none |
| StringTruncationChecking | error |
| SignalRangeChecking | none |
| ReadBeforeWriteMsg | UseLocalSettings |
| WriteAfterWriteMsg | UseLocalSettings |
| WriteAfterReadMsg | UseLocalSettings |
| AlgebraicLoopMsg | warning |
| ArtificialAlgebraicLoopMsg | warning |

| | |
|---|---|
| SaveWithDisabledLinksMsg | warning |
| SaveWithParameterizedLinksMsg | warning |
| CheckSSInitialOutputMsg | on |
| UnderspecifiedInitializationDetection | Simplified |
| MergeDetectMultiDrivingBlocksExec | error |
| SignalResolutionControl | UseLocalSettings |
| BlockPriorityViolationMsg | warning |
| MinStepSizeMsg | warning |
| TimeAdjustmentMsg | none |
| MaxConsecutiveZCsMsg | error |
| MaskedZcDiagnostic | warning |
| IgnoredZcDiagnostic | warning |
| SolverPrmCheckMsg | none |
| InheritedTsInSrcMsg | warning |
| MultiTaskDSMMsg | error |
| MultiTaskCondExecSysMsg | error |
| MultiTaskRateTransMsg | error |
| SingleTaskRateTransMsg | none |
| TasksWithSamePriorityMsg | warning |
| SigSpecEnsureSampleTimeMsg | warning |
| CheckMatrixSingularityMsg | none |
| IntegerOverflowMsg | warning |
| Int32ToFloatConvMsg | warning |
| ParameterDowncastMsg | error |
| ParameterOverflowMsg | error |
| ParameterUnderflowMsg | none |
| ParameterPrecisionLossMsg | warning |
| ParameterTunabilityLossMsg | warning |
| FixptConstUnderflowMsg | none |
| FixptConstOverflowMsg | none |
| FixptConstPrecisionLossMsg | none |
| UnderSpecifiedDataTypeMsg | none |
| UnnecessaryDatatypeConvMsg | none |
| VectorMatrixConversionMsg | none |
| FcnCallInpInsideContextMsg | error |
| SignalLabelMismatchMsg | none |

| | |
|---|---|
| UnconnectedInputMsg | warning |
| UnconnectedOutputMsg | warning |
| UnconnectedLineMsg | warning |
| UseOnlyExistingSharedCode | error |
| SFcnCompatibilityMsg | none |
| FrameProcessingCompatibilityMsg | error |
| UniqueDataStoreMsg | none |
| BusObjectLabelMismatch | warning |
| RootOutportRequireBusObject | warning |
| AssertControl | UseLocalSettings |
| AllowSymbolicDim | on |
| ModelReferenceIOMsg | none |
| ModelReferenceVersionMismatchMessage | none |
| ModelReferenceIOMismatchMessage | none |
| UnknownTsInhSupMsg | warning |
| ModelReferenceDataLoggingMessage | warning |
| ModelReferenceNoExplicitFinalValueMsg | none |
| ModelReferenceSymbolNameMessage | warning |
| ModelReferenceExtraNoncontSigs | error |
| StateNameClashWarn | none |
| OperatingPointInterfaceChecksumMismatchMsg | warning |
| NonCurrentReleaseOperatingPointMsg | error |
| PregeneratedLibrarySubsystemCodeDiagnostic | warning |
| SubsystemReferenceDiagnosticForUnitTest | error |
| InitInArrayFormatMsg | warning |
| StrictBusMsg | ErrorLevel1 |
| BusNameAdapt | WarnAndRepair |
| NonBusSignalsTreatedAsBus | none |
| SFUnusedDataAndEventsDiag | warning |
| SFUnexpectedBacktrackingDiag | error |
| SFInvalidInputDataAccessInChartInitDiag | warning |
| SFNoUnconditionalDefaultTransitionDiag | error |
| SFTransitionOutsideNaturalParentDiag | warning |
| SFUnreachableExecutionPathDiag | warning |
| SFUndirectedBroadcastEventsDiag | warning |
| SFTransitionActionBeforeConditionDiag | warning |

| | |
|---|---|
| SFOutputUsedAsStateInMooreChartDiag | error |
| SFTemporalDelaySmallerThanSampleTimeDiag | warning |
| SFSelfTransitionDiag | warning |
| SFExecutionAtInitializationDiag | warning |
| IntegerSaturationMsg | warning |
| AllowedUnitSystems | all |
| UnitsInconsistencyMsg | warning |
| AllowAutomaticUnitConversions | on |
| RCSCRenamedMsg | warning |
| RCSCObservableMsg | warning |
| ForceCombineOutputUpdateInSim | off |
| UnderSpecifiedDimensionMsg | none |
| DebugExecutionForFMUViaOutOfProcess | off |
| ArithmeticOperatorsInVariantConditions | error |
| VariantConditionMismatch | none |
| InheritVATfromSVC | warning |
| VariantConfigNotUsedByTopModel | warning |
| ParamWriterValidationControl | UseLocalSettings |

**Table 6.6. cefasRL Configuration Set.Components(5)**

| **Property** | **Value** |
|---|---|
| Name | Hardware Implementation |
| Description | |
| Components | |
| ProdBitPerChar | 8 |
| ProdBitPerShort | 16 |
| ProdBitPerInt | 32 |
| ProdBitPerLong | 32 |
| ProdBitPerLongLong | 64 |
| ProdBitPerFloat | 32 |
| ProdBitPerDouble | 64 |
| ProdBitPerPointer | 64 |
| ProdBitPerSizeT | 64 |
| ProdBitPerPtrDiffT | 64 |
| ProdLargestAtomicInteger | Char |
| ProdLargestAtomicFloat | Float |

| | |
|---|---|
| ProdIntDivRoundTo | Zero |
| ProdEndianess | LittleEndian |
| ProdWordSize | 64 |
| ProdShiftRightIntArith | on |
| ProdLongLongMode | off |
| ProdHWDeviceType | Intel->x86-64 (Windows64) |
| TargetBitPerChar | 8 |
| TargetBitPerShort | 16 |
| TargetBitPerInt | 32 |
| TargetBitPerLong | 32 |
| TargetBitPerLongLong | 64 |
| TargetBitPerFloat | 32 |
| TargetBitPerDouble | 64 |
| TargetBitPerPointer | 32 |
| TargetBitPerSizeT | 32 |
| TargetBitPerPtrDiffT | 32 |
| TargetLargestAtomicInteger | Char |
| TargetLargestAtomicFloat | None |
| TargetShiftRightIntArith | on |
| TargetLongLongMode | off |
| TargetIntDivRoundTo | Undefined |
| TargetEndianess | Unspecified |
| TargetWordSize | 32 |
| TargetPreprocMaxBitsSint | 32 |
| TargetPreprocMaxBitsUint | 32 |
| TargetHWDeviceType | Specified |
| TargetUnknown | off |
| ProdEqTarget | on |
| UseEmbeddedCoderFeatures | on |
| UseSimulinkCoderFeatures | on |
| HardwareBoardFeatureSet | EmbeddedCoderHSP |

### Table 6.7. cefasRL Configuration Set.Components(6)

| **Property** | **Value** |
|---|---|
| Name | Model Referencing |
| Description | |

| | |
|---|---|
| Components | |
| UpdateModelReferenceTargets | IfOutOfDateOrStructuralChange |
| EnableRefExpFcnMdlSchedulingChecks | on |
| CheckModelReferenceTargetMessage | error |
| EnableParallelModelReferenceBuilds | off |
| ParallelModelReferenceErrorOnInvalidPool | on |
| ParallelModelReferenceMATLABWorkerInit | None |
| ModelReferenceNumInstancesAllowed | Multi |
| PropagateVarSize | Infer from blocks in model |
| ModelDependencies | |
| ModelReferencePassRootInputsByReference | on |
| ModelReferenceMinAlgLoopOccurrences | off |
| PropagateSignalLabelsOutOfModel | on |
| SupportModelReferenceSimTargetCustomCode | off |
| UseModelRefSolver | off |

### Table 6.8. cefasRL Configuration Set.Components(7)

| **Property** | **Value** |
|---|---|
| Name | Simulation Target |
| Description | |
| Components | |
| SimCustomSourceCode | |
| SimCustomHeaderCode | |
| SimCustomInitializer | |
| SimCustomTerminator | |
| SimReservedNameArray | |
| SimUserSources | |
| SimUserIncludeDirs | |
| SimUserLibraries | |
| SimUserDefines | |
| SimCustomCompilerFlags | |
| SimCustomLinkerFlags | |
| SFSimEnableDebug | off |
| SFSimEcho | on |
| SimCtrlC | on |
| SimIntegrity | on |

| | |
|---|---|
| SimUseLocalCustomCode | on |
| SimParseCustomCode | on |
| SimAnalyzeCustomCode | off |
| SimDebugExecutionForCustomCode | off |
| SimGenImportedTypeDefs | off |
| CompileTimeRecursionLimit | 50 |
| EnableRuntimeRecursion | on |
| EnableImplicitExpansion | on |
| MATLABDynamicMemAlloc | on |
| MATLABDynamicMemAllocThreshold | 65536 |
| LegacyBehaviorForPersistentVarInContinuousTime | off |
| CustomCodeFunctionArrayLayout | |
| DefaultCustomCodeFunctionArrayLayout | NotSpecified |
| CustomCodeUndefinedFunction | FilterOut |
| CustomCodeGlobalsAsFunctionIO | off |
| DefaultCustomCodeDeterministicFunctions | None |
| CustomCodeDeterministicFunctions | |
| SimHardwareAcceleration | generic |
| SimTargetLang | C |
| GPUAcceleration | off |
| SimGPUMallocThreshold | 200 |
| SimGPUStackLimitPerThread | 1024 |
| SimGPUErrorChecks | off |
| SimGPUCustomComputeCapability | |
| SimGPUCompilerFlags | |
| SimDLTargetLibrary | mkl-dnn |
| SimDLAutoTuning | on |

### Table 6.9. cefasRL Configuration Set.Components(8)

| **Property** | **Value** |
|---|---|
| Name | Code Generation |
| Description | |
| SystemTargetFile | grt.tlc |
| EmbeddedCoderDictionary | |
| HardwareBoard | None |
| ShowCustomHardwareApp | off |

| | |
|---|---|
| ShowEmbeddedHardwareApp | off |
| TLCOptions | |
| GenCodeOnly | off |
| MakeCommand | make_rtw |
| GenerateMakefile | on |
| PackageGeneratedCodeAndArtifacts | off |
| PackageName | |
| TemplateMakefile | grt_default_tmf |
| PostCodeGenCommand | |
| GenerateReport | off |
| RTWVerbose | on |
| RetainRTWFile | off |
| ProfileTLC | off |
| TLCDebug | off |
| TLCCoverage | off |
| TLCAssert | off |
| BuiltinFFTWCallback | off |
| RTWUseLocalCustomCode | on |
| RTWUseSimCustomCode | off |
| CustomSourceCode | |
| CustomHeaderCode | |
| CustomInclude | |
| CustomSource | |
| CustomLibrary | |
| CustomDefine | |
| CustomBLASCallback | |
| CustomLAPACKCallback | |
| CustomFFTCallback | |
| CustomInitializer | |
| CustomTerminator | |
| Toolchain | Automatically locate an installed toolchain |
| BuildConfiguration | Faster Builds |
| CustomToolchainOptions | |
| IncludeHyperlinkInReport | off |
| LaunchReport | off |
| PortableWordSizes | off |

| | |
|---|---|
| CreateSILPILBlock | None |
| CodeExecutionProfiling | off |
| CodeExecutionProfileVariable | executionProfile |
| CodeProfilingSaveOptions | SummaryOnly |
| CodeProfilingInstrumentation | off |
| CodeStackProfiling | off |
| CodeStackProfileVariable | stackProfile |
| CodeCoverageSettings | cefasRL Configuration Set.Components(8).CodeCoverageSettings |
| SILPILDebugging | off |
| DataTypeReplacement | CoderTypedefs |
| CoderTypedefsCompatibility | off |
| TargetLang | C |
| GenerateGPUCode | None |
| HalideCodeGeneration | off |
| GenerateTraceInfo | off |
| GenerateTraceReport | off |
| GenerateTraceReportSl | off |
| GenerateTraceReportSf | off |
| GenerateTraceReportEml | off |
| GenerateWebview | off |
| GenerateCodeMetricsReport | off |
| GenerateCodeReplacementReport | off |
| RTWCompilerOptimization | off |
| ObjectivePriorities | |
| RTWCustomCompilerOptimizations | |
| CheckMdlBeforeBuild | Off |
| GPUKernelNamePrefix | |
| GPUDeviceID | -1 |
| GPUMallocMode | discrete |
| GPUMallocThreshold | 200 |
| GPUEnableMemoryManager | off |
| GPUStackLimitPerThread | 1024 |
| GPUcuBLAS | on |
| GPUcuSOLVER | on |
| GPUcuFFT | on |
| GPUErrorChecks | off |

| | |
|---|---|
| GPUComputeCapability | 3.5 |
| GPUCustomComputeCapability | |
| GPUCompilerFlags | |
| GPUMaximumBlocksPerKernel | 0 |
| DLTargetLibrary | none |
| DLAutoTuning | on |
| DLArmComputeVersion | 19.05 |
| DLArmComputeArch | unspecified |
| DLLearnablesCompression | None |
| Components | [cefasRL Configuration Set.Components(8).Components(1), cefasRL Configuration Set.Components(8).Components(2)] |

### Table 6.10. cefasRL Configuration Set.Components(9)

| Property | Value |
|---|---|
| Description | Simulink Coverage Configuration Component |
| Components | |
| Name | Simulink Coverage |
| CovEnable | off |
| CovScope | EntireSystem |
| CovIncludeTopModel | on |
| RecordCoverage | off |
| CovPath | / |
| CovSaveName | covdata |
| CovCompData | |
| CovMetricSettings | dwe |
| CovFilter | |
| CovHTMLOptions | |
| CovNameIncrementing | off |
| CovForceBlockReductionOff | on |
| CovEnableCumulative | on |
| CovSaveCumulativeToWorkspaceVar | off |
| CovSaveSingleToWorkspaceVar | off |
| CovCumulativeVarName | covCumulativeData |
| CovCumulativeReport | off |
| CovSaveOutputData | on |
| CovOutputDir | slcov_output/$ModelName$ |

| | |
|---|---|
| CovDataFileName | $ModelName$_cvdata |
| CovReportOnPause | on |
| CovModelRefEnable | off |
| CovModelRefExcluded | |
| CovExternalEMLEnable | on |
| CovSFcnEnable | on |
| CovBoundaryAbsTol | 1.0000e-05 |
| CovBoundaryRelTol | 0.0100 |
| CovUseTimeInterval | off |
| CovStartTime | 0 |
| CovStopTime | 0 |
| CovMetricStructuralLevel | Decision |
| CovMetricLookupTable | off |
| CovMetricSignalRange | off |
| CovMetricSignalSize | off |
| CovMetricObjectiveConstraint | off |
| CovMetricSaturateOnIntegerOverflow | off |
| CovMetricRelationalBoundary | off |
| CovLogicBlockShortCircuit | off |
| CovUnsupportedBlockWarning | on |
| CovMcdcMode | Masking |
| CovExcludeInactiveVariants | off |

### Table 6.11. cefasRL Configuration Set.Components(10)

| Property | Value |
|---|---|
| Description | HDL Coder custom configuration component |
| Components | |
| Name | HDL Coder |

### Table 6.12. cefasRL Configuration Set.Components(8).CodeCoverageSettings

| Property | Value |
|---|---|
| TopModelCoverage | off |
| ReferencedModelCoverage | off |
| CoverageTool | None |

**Table 6.13. cefasRL Configuration Set.Components(8).Components(1)**

| Property | Value |
|---|---|
| Name | Code Appearance |
| Description | |
| Components | |
| ForceParamTrailComments | off |
| GenerateComments | on |
| CommentStyle | Auto |
| IgnoreCustomStorageClasses | on |
| IgnoreTestpoints | off |
| MaxIdLength | 31 |
| ShowEliminatedStatement | off |
| OperatorAnnotations | off |
| SimulinkDataObjDesc | off |
| SFDataObjDesc | off |
| MATLABFcnDesc | off |
| MangleLength | 1 |
| SharedChecksumLength | 8 |
| CustomSymbolStrGlobalVar | $R$N$M |
| CustomSymbolStrType | $N$R$M_T |
| CustomSymbolStrField | $N$M |
| CustomSymbolStrFcn | $R$N$M$F |
| CustomSymbolStrFcnArg | rt$I$N$M |
| CustomSymbolStrBlkIO | rtb_$N$M |
| CustomSymbolStrTmpVar | $N$M |
| CustomSymbolStrMacro | $R$N$M |
| CustomSymbolStrUtil | $N$C |
| CustomSymbolStrEmxType | emxArray_$M$N |
| CustomSymbolStrEmxFcn | emx$M$N |
| CustomUserTokenString | |
| CustomCommentsFcn | |
| DefineNamingRule | None |
| DefineNamingFcn | |
| ParamNamingRule | None |
| ParamNamingFcn | |
| SignalNamingRule | None |

| | |
|---|---|
| SignalNamingFcn | |
| InsertBlockDesc | off |
| InsertPolySpaceComments | off |
| SimulinkBlockComments | on |
| BlockCommentType | BlockPathComment |
| StateflowObjectComments | off |
| MATLABSourceComments | off |
| EnableCustomComments | off |
| InternalIdentifier | Shortened |
| InlinedPrmAccess | Literals |
| ReqsInCode | off |
| UseSimReservedNames | off |
| ReservedNameArray | |
| EnumMemberNameClash | error |

**Table 6.14. cefasRL Configuration Set.Components(8).Components(2)**

| Property | Value |
|---|---|
| Name | Target |
| Description | |
| Components | |
| IsERTTarget | off |
| TargetLibSuffix | |
| TargetPreCompLibLocation | |
| TargetLangStandard | C99 (ISO) |
| CodeReplacementLibrary | None |
| UtilityFuncGeneration | Auto |
| MultiwordTypeDef | System defined |
| MultiwordLength | 2048 |
| DynamicStringBufferSize | 256 |
| GenerateFullHeader | on |
| InferredTypesCompatibility | off |
| ExistingSharedCode | |
| GenerateSampleERTMain | off |
| GenerateTestInterfaces | off |
| ModelReferenceCompliant | on |
| ParMdlRefBuildCompliant | on |

| | |
|---|---|
| CompOptLevelCompliant | on |
| ConcurrentExecutionCompliant | on |
| IncludeMdlTerminateFcn | on |
| CombineOutputUpdateFcns | on |
| CombineSignalStateStructs | off |
| GroupInternalDataByFunction | off |
| SuppressErrorStatus | off |
| IncludeFileDelimiter | Auto |
| ERTCustomFileBanners | off |
| SupportAbsoluteTime | on |
| LogVarNameModifier | rt_ |
| MatFileLogging | on |
| MultiInstanceERTCode | off |
| CodeInterfacePackaging | Nonreusable function |
| PurelyIntegerCode | off |
| SupportNonFinite | on |
| SupportComplex | on |
| SupportContinuousTime | on |
| SupportNonInlinedSFcns | on |
| RemoveDisableFunc | off |
| RemoveResetFunc | off |
| SupportVariableSizeSignals | off |
| ParenthesesLevel | Nominal |
| CastingMode | Nominal |
| ModelStepFunctionPrototypeControlCompliant | off |
| CPPClassGenCompliant | on |
| GRTInterface | off |
| GenerateAllocFcn | off |
| UseToolchainInfoCompliant | on |
| GenerateSharedConstants | on |
| LUTObjectStructOrderExplicitValues | Size,Breakpoints,Table |
| LUTObjectStructOrderEvenSpacing | Size,Breakpoints,Table |
| ArrayLayout | Column-major |
| UnsupportedSFcnMsg | error |
| ERTHeaderFileRootName | $R$E |
| ERTSourceFileRootName | $R$E |

| | |
|---|---|
| ERTDataFileRootName | $R_data |
| InstructionSetExtensions | {None} |
| OptimizeReductions | off |
| IsSLRTTarget | off |
| ExtMode | off |
| ExtModeStaticAlloc | off |
| ExtModeTesting | off |
| ExtModeAutomaticAllocSize | on |
| ExtModeMaxTrigDuration | 10 |
| ExtModeStaticAllocSize | 1000000 |
| ExtModeTransport | 0 |
| ExtModeMexFile | ext_comm |
| ExtModeMexArgs | |
| ExtModeIntrfLevel | Level1 |
| RTWCAPISignals | off |
| RTWCAPIParams | off |
| RTWCAPIStates | off |
| RTWCAPIRootIO | off |
| MultiInstanceErrorCode | Error |

### Table 6.15. HDL Coder

| **Property** | **Value** |
|---|---|
| HDLSubsystem | cefasRL |
| Workflow | Generic ASIC/FPGA |
| TargetPlatform | |
| ReferenceDesign | |
| ReferenceDesignPath | |
| CoeffPrefix | coeff |
| DownToArrayIndexing | off |
| BooleanVectorDownTo | on |
| InputType | std_logic_vector |
| OutputType | Same as input type |
| ScalarizePorts | off |
| ScalarizedPortIndexing | Zero-based |
| SamplesPerCycle | 1 |
| InputFIFOSize | 10 |

| | |
|---|---|
| OutputFIFOSize | 10 |
| DelaySizeThreshold | 10000 |
| CoeffMultipliers | Multiplier |
| ResetType | Asynchronous |
| FIRAdderStyle | linear |
| MultiplierInputPipeline | 0 |
| MultiplierOutputPipeline | 0 |
| FoldingFactor | 1 |
| NumMultipliers | -1 |
| OptimizeForHDL | off |
| TimingControllerPostfix | _tc |
| OptimizeTimingController | on |
| TimingControllerArch | default |
| CastBeforeSum | on |
| TCCounterLimitCompOp | >= |
| CheckHDL | off |
| EnablePrefix | enb |
| ClockEnableInputPort | clk_enable |
| ClockEnableOutputPort | ce_out |
| ClockInputPort | clk |
| ClockEdge | Rising |
| ResetInputPort | reset |
| SimulatorFlags | |
| HDLCompileFilePostfix | _compile.do |
| HDLCompileInit | vlib %s\n |
| HDLCompileTerm | |
| HDLCompileVerilogCmd | vlog %s %s\n |
| HDLCompileVHDLCmd | vcom %s %s\n |
| EnableForGenerateLoops | on |
| HDLMapFilePostfix | _map.txt |
| HDLMapSeparator | |
| HDLSimCmd | vsim -voptargs=+acc %s.%s\n |
| HDLSimFilePostfix | _sim.do |
| HDLSimProjectFilePostfix | _init.do |
| HDLSimInit | onbreak resume\nonerror resume\n |
| HDLSimProjectCmd | project addfile %s\n |

| | |
|---|---|
| HDLSimProjectTerm | project compileall\n |
| HDLSimProjectInit | project new . %s work\n |
| HDLSimTerm | run -all\n |
| HDLSimViewWaveCmd | add wave sim:%s\n |
| HDLSynthTool | None |
| HDLSynthCmd | |
| HDLSynthFilePostfix | |
| HDLSynthInit | |
| HDLSynthLibCmd | |
| HDLSynthLibSpec | |
| HDLSynthTerm | |
| ReservedWordPostfix | _rsvd |
| BlockGenerateLabel | _gen |
| VHDLLibraryName | work |
| UseSingleLibrary | off |
| VHDLArchitectureName | rtl |
| ClockProcessPostfix | _process |
| ComplexImagPostfix | _im |
| ComplexRealPostfix | _re |
| EntityConflictPostfix | _block |
| InstancePrefix | u_ |
| InstancePostfix | |
| InstanceGenerateLabel | _gen |
| OutputGenerateLabel | outputgen |
| PackagePostfix | _pkg |
| SplitEntityArch | off |
| SplitMooreChartStateUpdate | on |
| SplitEntityFilePostfix | _entity |
| SplitArchFilePostfix | _arch |
| VectorPrefix | vector_of_ |
| ClockInputs | Single |
| TriggerAsClock | off |
| AsyncResetPort | off |
| ConditionalizePipeline | off |
| InferControlPorts | off |
| UseRisingEdge | off |

| | |
|---|---|
| ProjectFolder | |
| TargetDirectory | hdlsrc |
| TargetSubdirectory | Model |
| EDAScriptGeneration | on |
| AddInputRegister | on |
| AddOutputRegister | on |
| AddPipelineRegisters | off |
| PipelinePostfix | _pipe |
| InputPort | filter_in |
| OutputPort | filter_out |
| FracDelayPort | filter_fd |
| Name | filter |
| RemoveResetFrom | None |
| ResetAssertedLevel | Active-high |
| ReuseAccum | off |
| ScaleWarnBits | 3 |
| SerialPartition | -1 |
| DALUTPartition | -1 |
| DARadix | 2 |
| CoefficientSource | Internal |
| CoefficientMemory | Registers |
| InputComplex | off |
| AddRatePort | off |
| InputDataType | |
| GenerateHDLCode | on |
| GenerateModel | on |
| GenerateTB | off |
| GenerateCEGenModel | off |
| ObfuscateGeneratedHDLCode | off |
| GenerateRecordType | off |
| Traceability | off |
| RuntimeReport | off |
| ResourceReport | off |
| OptimizationReport | off |
| ErrorCheckReport | on |
| HDLGenerateWebview | off |

| | |
|---|---|
| IPCoreReport | off |
| Recommendations | off |
| RequirementComments | on |
| EnableComments | on |
| ModelName | |
| Backannotation | off |
| HierarchicalDistPipelining | off |
| PreserveDesignDelays | off |
| AllowDelayDistribution | on |
| AcquireDesignDelaysForEMLOptimizations | off |
| ClockRatePipelining | on |
| CRPWithoutFlattening | on |
| CRPDelayBalancingIterLimit | 10 |
| AdaptivePipelining | off |
| LUTMapToRAM | on |
| CloneModules | on |
| MinDelaysRequiredAtLocalMultirateOutput | 1 |
| ClockRatePipelineOutputPorts | off |
| BalanceClockRateOutputPorts | off |
| CriticalPathEstimation | off |
| TimingDatabaseDirectory | |
| StaticLatencyPathAnalysis | off |
| shareequalwl | on |
| sharedmulsign | Signed |
| MultiplierPromotionThreshold | 0 |
| RoutingFudgeFactor | 0.5000 |
| OptimizationCompatibilityCheck | off |
| NumCriticalPathsEstimated | 1 |
| CriticalPathEstimationFile | criticalPathEstimated |
| SLPAFile | staticLatPathAnalysis |
| SLPALoopsFile | staticLatLoops |
| SLPABackEdgeFile | staticLatLoopBackEdge |

| | |
|---|---|
| SLPAGMMapMATFile | staticLatGMMap |
| HardwarePipeliningCharacterizationFile | |
| HardwarePipeliningParamWarning | 0 |
| HighlightFeedbackLoops | on |
| HighlightFeedbackLoopsFile | highlightFeedbackLoop |
| HighlightClockRatePipeliningDiagnostic | on |
| HighlightClockRatePipeliningFile | highlightClockRatePipelining |
| HighlightRemovedDeadBlocks | on |
| DistributedPipeliningBarriers | on |
| DistributedPipeliningBarriersFile | highlightDistributedPipeliningBarriers |
| HighlightDelayAbsorptionDiagnostic | on |
| HighlightDelayAbsorptionDiagnosticFile | highlightDelayAbsorption |
| HighlightLUTPipeliningDiagnostic | on |
| HighlightLUTPipeliningDiagnosticFile | highlightLUTPipeliningDiagnostic |
| SetLUTPipeliningOffScriptFile | setLUTPipelineOffScript |
| BlocksWithNoCharacterizationFile | highlightCriticalPathEstimationOffendingBlocks |
| AXIStreamingTransformFeatureControl | off |
| AXIInterface512BitDataPortFeatureControl | off |
| SerializerRatioThreshold | 8192 |
| RetimingCP | off |
| RetimingCPFile | highlightRetimingCP |
| ClearHighlightingFile | clearhighlighting |
| FunctionallyEquivalentRetiming | on |
| DistributedPipeliningPrecision | -1 |

| | |
|---|---|
| DistributedPipelining | off |
| UseSynthesisEstimatesForDistributedPipelining | off |
| DistributedPipeliningPriority | Numerical Integrity |
| PipelineDistributionPriority | Numerical Integrity |
| RetimingDetails | on |
| CriticalPathDetails | off |
| SignalNamesMangling | off |
| GuidedRetiming | off |
| LatencyConstraint | 0 |
| ReduceMatchingDelays | on |
| OptimizeBusDelayBalancing | on |
| OptimizationData | |
| CPGuidanceFile | |
| CPAnnotationFile | |
| OptimizeMdlGen | on |
| OptimizeHDLIP | off |
| MulticyclePathInfo | off |
| MulticyclePathConstraints | off |
| FloatingPointTargetConfiguration | |
| GenerateTargetComps | on |
| NativeFloatingPoint | off |
| FPToleranceValue | 1.0000e-07 |
| FPToleranceStrategy | DEFAULT |
| nfpLatency | DEFAULT |
| nfpDenormals | DEFAULT |
| UseFloatingPoint | off |
| sschdlMatrixProductSumCustomLatency | -1 |
| AlteraBackwardIncompatibleSinCosPipeline | off |
| FamilyDevicePackageSpeed | |
| ToolName | |
| SynthesisToolChipFamily | |
| SynthesisToolDeviceName | |
| SynthesisToolPackageName | |

| | |
|---|---|
| SynthesisToolSpeedValue | |
| SynthesisTool | |
| SynthesisProjectAdditionalFiles | |
| SimulationLibPath | |
| XilinxSimulatorLibPath | |
| AdderSharingMinimumBitwidth | 0 |
| MultiplierSharingMinimumBitwidth | 0 |
| MultiplyAddSharingMinimumBitwidth | 0 |
| ShareAdders | off |
| ShareMultipliers | on |
| ShareMultiplyAdds | on |
| ShareMATLABBlocks | on |
| ShareAtomicSubsystems | on |
| ShareCounterSerDes | off |
| UniqueGlobalSchedulingCounters | on |
| ShareFloatingPointIPs | on |
| PipelinedSharing | on |
| EnableFPGAWorkflow | off |
| FPGAWorkflowParameters | |
| GainMultipliers | Multiplier |
| ProductOfElementsStyle | linear |
| UserComment | |
| CustomFileHeaderComment | |
| CustomFileFooterComment | |
| DateComment | on |
| SafeZeroConcat | on |
| SumOfElementsStyle | linear |
| TargetLanguage | VHDL |
| TreatRatesAsHardwareRates | off |
| Oversampling | 1 |
| Verbosity | 1 |
| TestBenchName | filter_tb |

| | |
|---|---|
| MultifileTestBench | off |
| IgnoreDataChecking | 0 |
| TestBenchPostfix | _tb |
| TestBenchDataPostfix | _data |
| TestBenchStimulus | |
| TestBenchUserStimulus | |
| TestBenchFracDelayStimulus | |
| TestBenchCoeffStimulus | |
| TestBenchRateStimulus | |
| ForceClockEnable | on |
| MinimizeClockEnables | off |
| MinimizeGlobalResets | off |
| GenerateValidSignalInterface | off |
| StabilizeInputsForAperiodicRate | on |
| NoResetInitializationMode | InsideModule |
| NoResetInitScript | noresetinitscript.tcl |
| ComplexMulElaboration | MultiplyAddBlock |
| FlattenBus | off |
| TestBenchClockEnableDelay | 1 |
| ForceClock | on |
| ClockHighTime | 5 |
| ClockLowTime | 5 |
| HoldTime | 2 |
| InputDataInterval | 0 |
| ForceReset | on |
| ErrorMargin | 4 |
| HoldInputDataBetweenSamples | on |
| InitializeTestBenchInputs | off |
| ResetLength | 2 |
| TestBenchReferencePostFix | _ref |
| GenerateValidationModel | off |
| RAMMappingThreshold | 256 |
| IOThreshold | 5000 |
| TreatIOThresholdAs | Error |

| | |
|---|---|
| MapPipelineDelaysToRAM | off |
| RemoveRedundantCounters | on |
| ReplaceUnitDelayWithIntegerDelay | on |
| ConcatenateDelays | on |
| MergeDelaysOnFanouts | on |
| FoldDelaysToConstant | on |
| RAMArchitecture | WithClockEnable |
| RAMStyleAttributeName | |
| UseMatrixTypesInEML | on |
| InlineMATLABBlockCode | off |
| SubsystemReuse | Atomic only |
| InlineHDLCode | off |
| MaskParameterAsGeneric | off |
| InlineSubsystems | on |
| StringTypeSupport | off |
| DeleteUnusedBlocks | on |
| DeleteUnusedBlocksUnderMask | off |
| DeleteUnusedPorts | on |
| BalanceDelays | on |
| BalanceDelaysControlsFeedbackLoops | on |
| DelayAbsorption | on |
| TargetFrequency | 0 |
| ExtraEffortMargin | 1 |
| MaxOversampling | Inf |
| MaxComputationLatency | 1 |
| MultiplierPartitioningThreshold | Inf |
| TreatDelayBalancingFailureAs | Error |
| TransformDelaysWithControlLogic | on |
| TransformNonZeroInitValDelay | on |
| DelayElaborationLimit | 20 |
| TapDelayNoElab | on |
| GenerateCoSimBlock | off |

| | |
|---|---|
| HDLCodeCoverage | off |
| GenerateHDLTestBench | on |
| GenerateCoSimModel | None |
| GenerateSVDPITestBench | None |
| SimulationTool | Mentor Graphics ModelSim |
| CoSimModelSetup | CosimBlockAndDut |
| SynthesisOnDirective | |
| SynthesisOffDirective | |
| LoopUnrolling | off |
| InlineConfigurations | on |
| UseAggregatesForConst | off |
| UseVerilogTimescale | on |
| Timescale | `timescale 1 ns / 1 ns |
| VerilogFileExtension | .v |
| SystemVerilogFileExtension | .sv |
| VHDLFileExtension | .vhd |
| CodeGenerationOutput | GenerateHDLCode |
| GeneratedModelName | |
| GeneratedModelNamePrefix | gm_ |
| ValidationModelNameSuffix | _vnl |
| LayoutStyle | Default |
| UseDotLayout | off |
| ShowCodeGenPIR | off |
| SerializeModel | 0 |
| SerializeIO | 0 |
| AutoRoute | on |
| AutoPlace | on |
| InterBlkHorzScale | 1.7000 |
| InterBlkVertScale | 1.2000 |
| CustomDotPath | |
| HighlightAncestors | on |
| HighlightColor | cyan |
| InitializeBlockRAM | on |
| InitializeRealPort | off |
| MapVectorPortToStream | off |
| UseFileIOInTestBench | on |

| | |
|---|---|
| TurnkeyWorkflow | off |
| AlteraWorkflow | off |
| GenerateFILBlock | off |
| CoSimLibPostfix | _cosim |
| TestBenchInitializeInputs | off |
| MinimizeIntermediateSignals | off |
| GenerateCodeInfo | off |
| GatewayoutWithDTC | off |
| IncrementalCodeGenForTopModel | off |
| HDLWFSmartbuild | on |
| HDLCodingStandard | None |
| HDLCodingStandardCustomizations | |
| ReferenceDesignParameter | |
| HDLLintTool | None |
| HDLLintInit | |
| HDLLintTerm | |
| HDLLintCmd | |
| ModulePrefix | |
| DetectBlackBoxNameCollision | Warning |
| PIRTC | on |
| UsePipelinedToolboxFunctions | on |
| savepirtoscript | off |
| ConcatenateHDLModules | off |
| ML2PIR | off |
| OptimBetweenMATLABAndSimulink | off |
| EnableTestpoints | off |
| BalanceDelaysForTestpoints | on |
| GenDUTPortForTunableParam | on |
| BalanceDelaysForTunableParam | on |
| TraceabilityStyle | Line Level |
| TraceabilityProcessing | off |

| | |
|---|---|
| TreatRealsInGeneratedCodeAs | Error |
| TreatBalanceDelaysOffAs | Error |
| EnumEncodingScheme | default |
| CompileStrategy | CompileAll |
| BuildToProtectModel | off |
| OptimizeConstants | on |
| OptimizeFixedPointConstants | off |
| FrameToSampleConversion | off |
| InputProcessingOrder | RowMajor |
| HDLDTO | off |
| UseArrangeSystem | off |
| TriggerAsClockWithoutSyncRegisters | on |
| CompactSwitch | off |
| SimIndexCheck | off |
| ScheduleZeroProtection | on |
| DeploymentSettings | |

# Chapter 7. Glossary

**Atomic Subsystem.** A subsystem treated as a unit by an implementation of the design documented in this report. The implementation computes the outputs of all the blocks in the atomic subsystem before computing the next block in the parent system's block execution order (sorted list).

**Block Diagram.** A Simulink block diagram represents a set of simultaneous equations that relate a system or subsystem's inputs to its outputs as a function of time. Each block in the diagram represents an equation of the form y = f(t, x, u) where t is the current time, u is a block input, y is a block output, and x is a system state (see the Simulink documentation for information on the functions represented by the various types of blocks that make up the diagram). Lines connecting the blocks represent dependencies among the blocks, i.e., inputs whose current values are the outputs of other blocks. An implementation of a design described in this document computes a root or atomic system's outputs at each time step by computing the outputs of the blocks in an order determined by block input/output dependencies.

**Block Parameter.** A variable that determines the output of a block along with its inputs, for example, the gain parameter of a Gain block.

**Block Execution Order.** The order in which Simulink evaluates blocks during simulation of a model. The block execution order determined by Simulink ensures that a block executes only after all blocks on whose outputs it depends are executed.

**Checksum.** A number that indicates whether different versions of a model or atomic subsystem differ functionally or only cosmetically. Different checksums for different versions of the same model or subsystem indicate that the versions differ functionally.

**Design Variable.** A symbolic (MATLAB) variable or expression used as the value of a block parameter. Design variables allow the behavior of the model to be altered by altering the value of the design variable.

**Enumeration Type.** Enumerated data is data that is restricted to a finite set of values. An enumerated data type is a MATLAB® class that defines a set of enumerated values. Each enumerated value consists of an enumerated name and an underlying integer which the software uses internally and in generated code.

**Signal.** A block output, so-called because block outputs typically vary with time.

**Virtual Subsystem.** A subsystem that is purely graphical, i.e., is intended to reduce the visual complexity of the block diagram of which it is a subsystem. An implementation of the design treats the blocks in the subsystem as part of the first nonvirtual ancestor of the virtual subsystem (see Atomic Subsystem).

# Chapter 8. About this Report

## Report Overview

This report describes the design of the cefasRL system. The report was generated automatically from a Simulink model used to validate the design. It contains the following sections:

**Model Version.** Specifies information about the version of the model from which this design description was generated. Includes the model checksum, a number that indicates whether different versions of the model differ functionally or only cosmetically. Different checksums for different versions indicate that the versions differ functionally.

**Root System.** Describes the design's root system.

**Subsystems.** Describes each of the design's subsystems.

**Design Variables.** Describes system design variables, i.e., MATLAB variables and expressions used as block parameter values.

**Enumeration Type.** Describes the enumeration types used by this model.

**System Model Configuration.** Lists the configuration parameters, e.g., start and stop time, of the model used to simulate the system described by this report.

**Requirements.** Shows design requirements associated with elements of the design model. This section appears only if the design model contains requirements links.

**Glossary.** Defines Simulink terms used in this report.

## Root System Description

This section describes a design's root system. It contains the following sections:

**Diagram.** Simulink block diagram that represents the algorithm used to compute the root system's outputs.

**Description.** Description of the root system. This section appears only if the model's root system has a Documentation property or a Doc block.

**Interface.** Name, data type, width, and other properties of the root system's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the root system has input or output ports.

**Blocks.** This section has two subsections:

- **Parameters.** Describes key parameters of blocks in the root system. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, i.e., blocks that use lookup tables to compute their outputs.
- **Block Execution Order.** Order in which blocks must be executed at each time step in order to ensure that each block's inputs are available when it executes.

**State Charts.** Describes state charts used in the root system. This section appears only if the root system contains Stateflow blocks.

# Subsystem Descriptions

This section describes a design's subsystems. Each subsystem description contains the following sections:
**Checksum.** This section appears only if the subsystem is an atomic subsystem. The checksum indicates whether the version of the model subsystem used to generate this report differs functionally from other versions of the model subsystem. If two model checksums differ, the corresponding versions of the model differ functionally.
**Diagram.** Simulink block diagram that graphically represents the algorithm used to compute the subsystem's outputs.
**Description.** Description of the subsystem. This section appears only if the subsystem has a Documentation property or contains a Doc block.
**Interface.** Name, data type, width, and other properties of the subsystem's input and output signals. The number of the block port that outputs the signal appears in angle brackets appended to the signal name. This section appears only if the subsystem is atomic and has input or output ports.
**Blocks.** Blocks that this subsystem contains. This section has two subsections:

- **Parameters.** Key parameters of blocks in the subsystem. This section also includes graphical and/or tabular representations of lookup table data used by lookup table blocks, blocks that use lookup tables to compute their outputs.
- **Block Execution Order.** Order in which the subsystem's blocks must be executed at each time step in order to ensure that each block's inputs are available when the block executes .This section appears only if the subsystem is atomic. Note: in Acrobat(PDF) reports, the number in square brackets next to the block name is a hyperlink to the block parameter table. The number has no model significance.

**State Charts.** Describes state charts used in the subsystem. This section appears only if the root system contains Stateflow blocks.

# State Chart Descriptions

This section describes the state machines used by Stateflow blocks to compute their outputs, i.e., Stateflow blocks. Each state machine description contains the following sections:
**Chart.** Diagram representing the state machine.
**States.** Describes the state machine's states. Each state description includes the state's diagram and diagrams and/or descriptions of graphical functions, Simulink functions, truth tables, and MATLAB functions parented by the state.

**Transitions.** Transitions between the state machine's states. Each transition description specifies the values of key transition properties. Appears only if a transition has properties that do not appear on the chart.
**Junctions.** Transition junctions. Each junction description specifies the values of key junction properties. Appears only if a junction has properties that do not appear on the chart.
**Events.** Events that trigger state transitions. Each event description specifies the values of key event properties.
**Data.** Data types and other properties of the Stateflow block's inputs, outputs, and other state machine data.
**Targets.** Executable implementations of the state machine used to compute the outputs of the corresponding Stateflow block.
**MATLAB Supporting Functions.** List of functions invoked by MATLAB functions defined in the chart.