

Checking Implementation

Open module *PBoundedBuffer* in the Toolbox and create a small model that substitutes 4 for N and a set of three [model values](#) for Msg . (For example set Msg to $\{m1, m2, m\}$ and choose the **Set of model values** option.) Add the formula $C!Spec$ to the **Properties** list in the **What to check?** section of the **Model Overview** page of the model, and run TLC. It should find no error.

Now, let's introduce an error. In the **Definition Override** section of the model's **Advanced Options** page, override the definition of *chBar* with the following definition.

$[i \in 1..(p \ominus c) \mapsto$ $\text{IF } p \ominus c = N \text{ THEN } \text{buf}[0]$ $\text{ELSE } \text{buf}[(c + i - 1) \% N]]$	$[\text{in}_1..(\text{p}(-)_{\text{uc}})_{\text{U}} \mapsto$ $\text{IF } \text{p}(-)_{\text{uc}} = \text{N} \text{ THEN } \text{buf}[0]$ $\text{ELSE } \text{buf}[(c_{\text{U}} + \text{in}_1 - 1)_{\text{U}} \% \text{N}]]$
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This changes the definition of *chBar* when $p \oplus c$ equals N , so it should introduce an error when the length of the sequence of sent messages reaches N , which can occur only after at least N steps.

Running TLC should now produce an error. Clicking on the location of the error leads to the formula $\Box[Next]_{vars}$ in module *PCalBoundedChannel*, indicating that the bounded buffer specification does not satisfy the property $\Box[Next]_{vars}$. (Here and in the rest of this pop-up, *Next* is the formula by that name in module *PCalBoundedChannel*.)

To see why that property is violated, use the trace explorer to display the values of *chBar* during the execution. In the Error-Trace Exploration section of the TLC Errors window, use the Add button to enter the expression *chBar*. Click on the Explore button to run the trace explorer. The behavior shown in the Error-Trace section should now show the value of *chBar* in each state. Let's call that behavior σ . The behavior $\bar{\sigma}$ is defined to be the one whose i^{th} state assigns to the variable *ch* the value of *chBar* in the i^{th} state of σ . The formula $\Box \overline{[Next]_{vars}}$ is true of σ iff $\Box [Next]_{vars}$ is true of $\bar{\sigma}$, and $\Box [Next]_{vars}$ is not true of $\bar{\sigma}$ because the last step of $\bar{\sigma}$ does not satisfy $[Next]_{vars}$.

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