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## Problem of the Month - September 2023

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A row of 2023 houses is situated adjacent to each other. In each house, only one person resides, and that individual can either be happy or sad on the day of the annual festival. A person cannot be happy if both of their neighbors are sad. Furthermore, a happy person must have at least one happy neighbor. Additionally, the number of consecutive houses where happy people reside must be an even number.

Sad individuals celebrate the annual festival quietly and in solitude. If two happy neighbors are adjacent to each other, they exchange gifts and celebrate together joyously.

How many different ways can the celebrations occur, considering all the possibilities of having one or more sad persons?

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